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Richard B. Russell Dam and Lake

Savannah River, Georgia And South Carolina

Final Foundation Report

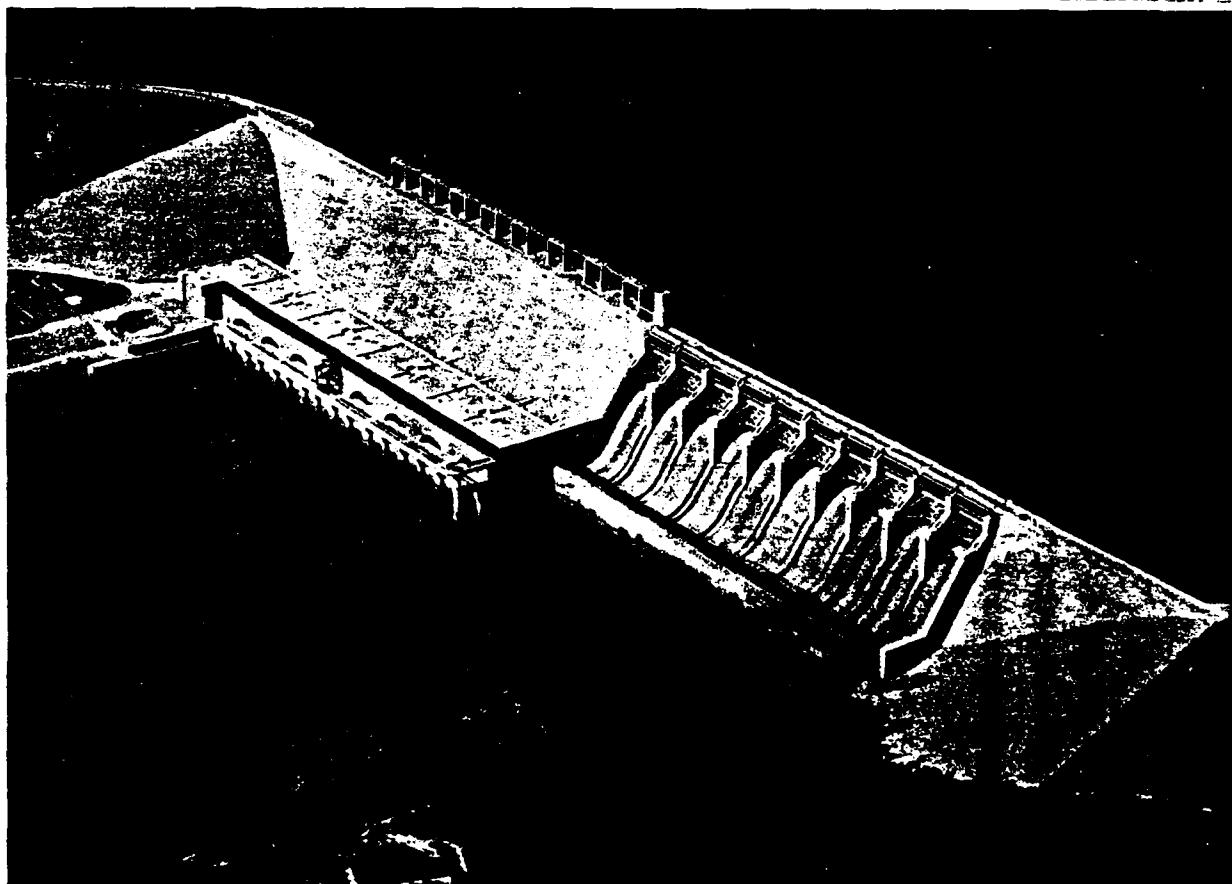
Volume 2 of 2

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Overview Of Richard B. Russell Dam And Powerhouse



US Army Corps
of Engineers
Savannah District

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RICHARD B. RUSSELL PROJECT

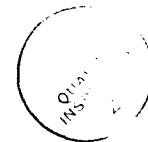
SAVANNAH RIVER, GEORGIA AND SOUTH CAROLINA

FINAL FOUNDATION REPORT

CONCRETE DAM, EMBANKMENTS, AND POWERHOUSE

In Two Volumes

VOLUME II - APPENDICES



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CORPS OF ENGINEERS
SAVANNAH, GEORGIA

APPENDICES

(Volume II)

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APPENDIX A

ROCK TESTING DATA

<p style="text-align: center;">U. S. ARMY ENGINEER DIVISION LABORATORY, SOUTH ATLANTIC CORPS OF ENGINEERS MARIETTA, GEORGIA</p>		<p style="text-align: center;">DISTRICT Savannah</p> <p style="text-align: center;">PROJECT Trotters Shoals</p> <p style="text-align: center;">CONTRACT NO.</p>																					
<p style="text-align: center;">GENERAL TEST REPORT</p> <p style="text-align: center;">(ROCK CORES)</p>		<p style="text-align: center;">DATE REPORTED 15 Sept. 1970</p> <p style="text-align: center;">WORK ORDER NO. 6531</p>																					
<p style="text-align: center;">DESCRIPTION NX Rock Cores</p>		<p style="text-align: center;">REQN. NO. SAS-ENG-TROT-15</p>																					
<p style="text-align: center;">SOURCE Job Site</p>		<p style="text-align: center;">BASE UNIT COST</p>																					
<p style="text-align: center;">FOR USE AS:</p>		<p style="text-align: center;">DATE SAMPLE RECEIVED 9-8-70</p>																					
<p style="text-align: center;">TESTED FOR: Sonic Velocity</p>		<p style="text-align: center;">LAB NO. See below</p>																					
<p style="text-align: center;">→ <input type="checkbox"/> MEETS SPECIFICATIONS</p>		<p style="text-align: center;">→ <input type="checkbox"/> FAILS SPECIFICATIONS (See below)</p>																					
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center; padding: 5px;">Lab. No.</th> <th style="text-align: center; padding: 5px;">Role No.</th> <th style="text-align: center; padding: 5px;">Sonic * Velocity</th> <th style="text-align: center; padding: 5px;">Remarks</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">1M2662</td> <td style="padding: 5px;">C-152</td> <td style="padding: 5px; text-align: center;">16,640</td> <td style="padding: 5px;">Cataclastic textured. There are no apparent defects in the rock. Sample is similar to sample from Hole C-191.</td> </tr> <tr> <td style="padding: 5px;">1M2663</td> <td style="padding: 5px;">C-153</td> <td style="padding: 5px; text-align: center;">12,470</td> <td style="padding: 5px;">Granitic (interlocking) textured. Sample contained numerous horizontal and steeply dipping well healed fractures.</td> </tr> <tr> <td style="padding: 5px;">1M2664</td> <td style="padding: 5px;">C-154</td> <td style="padding: 5px; text-align: center;">15,180</td> <td style="padding: 5px;">Granitic (interlocking) textured. Sample contained several steeply dipping well healed fractures. Fractures are not as numerous as in sample C-153 and are calcite filled.</td> </tr> <tr> <td style="padding: 5px;">1M2665</td> <td style="padding: 5px;">C-164</td> <td style="padding: 5px; text-align: center;">15,110</td> <td style="padding: 5px;">Primarily cataclastic textured. A vertical calcite healed fracture separates material similar to sample C-152 from more basic material. Basic material approximates 25% of rock. There are some horizontal to steeply dipping well healed calcite filled fractures.</td> </tr> </tbody> </table>				Lab. No.	Role No.	Sonic * Velocity	Remarks	1M2662	C-152	16,640	Cataclastic textured. There are no apparent defects in the rock. Sample is similar to sample from Hole C-191.	1M2663	C-153	12,470	Granitic (interlocking) textured. Sample contained numerous horizontal and steeply dipping well healed fractures.	1M2664	C-154	15,180	Granitic (interlocking) textured. Sample contained several steeply dipping well healed fractures. Fractures are not as numerous as in sample C-153 and are calcite filled.	1M2665	C-164	15,110	Primarily cataclastic textured. A vertical calcite healed fracture separates material similar to sample C-152 from more basic material. Basic material approximates 25% of rock. There are some horizontal to steeply dipping well healed calcite filled fractures.
Lab. No.	Role No.	Sonic * Velocity	Remarks																				
1M2662	C-152	16,640	Cataclastic textured. There are no apparent defects in the rock. Sample is similar to sample from Hole C-191.																				
1M2663	C-153	12,470	Granitic (interlocking) textured. Sample contained numerous horizontal and steeply dipping well healed fractures.																				
1M2664	C-154	15,180	Granitic (interlocking) textured. Sample contained several steeply dipping well healed fractures. Fractures are not as numerous as in sample C-153 and are calcite filled.																				
1M2665	C-164	15,110	Primarily cataclastic textured. A vertical calcite healed fracture separates material similar to sample C-152 from more basic material. Basic material approximates 25% of rock. There are some horizontal to steeply dipping well healed calcite filled fractures.																				
<p>REMARKS: *Tests performed by Law Engineering Testing Co., Atlanta, Georgia.</p>																							
<p>REPORTED BY:</p>		<p><input type="checkbox"/> PHONE <input type="checkbox"/> WIRE</p>																					
<p>DATE:</p>		<p>TESTED BY * SAMPLED BY</p>																					
		<p>CHECKED BY GVJ</p>																					



LAW ENGINEERING TESTING COMPANY

Geotechnical and Materials Engineers

412 PLASTERS AVENUE, N.E. / ATLANTA, GEORGIA 30324 / (404) 873-4761

August 31, 1970

Client: Department of the Army
South Atlantic Division Laboratory
Corps of Engineers
611 South Cobb Drive (Ga. Hwy. 230)
Marietta, Georgia 30060

Subject: Pulse Velocity Tests on
Rock Cores

Our Job Number: E-1435

Date of Testing: August 31, 1970

On the above date pulse velocity tests were performed on ten (10) rock cores samples submitted by your laboratory. The following table lists the samples tested and the results of those tests.

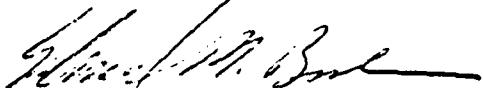
Sample Number	Length		Time	Velocity (fps)
	Inches	Feet	Microsecond	
C-191 (3)	11.783	0.9819	52	18,800
C-130	12.054	1.0045	46.5	21,600
C-192 (3)	12.043	1.0035	82.5	12,100
C-127	12.017	1.0014	51	19,600
C-129	11.814	0.9845	82	12,000
C-146	12.028	1.0023	55.5	18,000
C-189 (4)	12.116	1.0096	66	15,200
C-189 (1)	12.063	1.00525	67	15,000
C-202 (3)	12.014	1.00116	66	14,700
C-190 (3)	12.034	1.0070	70.5	14,300

Note: Lengths measured by SADL.

It was our pleasure to furnish you with this service and if we can be of any further assistance please do not hesitate to contact this office.

Respectfully submitted,

LAW ENGINEERING TESTING COMPANY



Edward M. Beck
Manager Non-destructive Testing Department

6) Department of the Army, SAD Laboratory
Corps of Engineers

U. S. ARMY ENGINEER DIVISION LABORATORY, SOUTH ATLANTIC
CORPS OF ENGINEERS
MARIETTA, GEORGIA

DISTRICT Savannah	
PROJECT Trotters Shoals Dam	
CONTRACT NO.	
DATE REPORTED 23 July 1970	
WORK ORDER NO. 6401	
REQN. NO. SAS-ENG-TROT-11	
SOURCE Job Site	BASE UNIT COST
FOR USE AS:	DATE SAMPLE RECEIVED 5-13-70
TESTED FOR: Direct Shear Strength of Rock & Conc. on Rock & Coef. of Sliding Friction of Rock on Rock & Conc. on Rock	LAB NO. See below

		MEETS SPECIFICATIONS		FAILS SPECIFICATIONS (See below)	
Lab. No.	Hole No.	Normal Load PSF	Direct Shear Strength - PSI	Coefficient of Sliding Friction (Sliding Load/Normal Load)	
		Rock	Concrete on Rock*	Rock on Rock**	Concrete on Rock
1M2512	C-146	5,000	3,590	440	1.67
1M2513	C-130	10,000	3,250	200	1.51
1M2514	C-7	13,000	4,075	152	1.49
1M2515	C-129	4,000	2,180	165	3.61
1M2516	C-29	9,000	3,190	90	1.37
1M2517	C-132	12,000	2,390	265	3.08
1M2518	C-144	20,000	2,115	134	0.98
					1.08

REMARKS: *Concrete cast against broken faces and cured 7 days.

**Samples tended to "ride-up" on the high points as sliding progressed. There was no evidence of shear but some surface abrasion did occur. See the continuation sheet for a detailed description of the joints before testing.

REPORTED BY:	□ PHONE	□ WIRE	TESTED BY	CHECKED BY
			HLM	CVJ
DATE:			SAMPLED BY	

GENERAL TEST REPORT (Continued)

(ROCK CORES)Lab. No. See below Date 23 July 1970

<u>Lab. No.</u>	<u>Hole No.</u>	<u>Description of Sliding Friction "Rock on Rock" Joint</u>
IM2512	C-146	Dip angle 15° ; rough undulating surface across fine grained interlocking granular textured rock. Limonite stains indicate slight weathering.
IM2513	C-130	Dip angle 5° ; rough undulating surface across medium to coarse grained interlocking granular textured rock. Fresh surface.
IM2514	C-7	Dip angle 5° ; plane smooth surface. Fine uniform textured grain. Fresh surface appears to line up along a schistose plane.
IM2515	C-129	Dip angle 5° ; rough undulating surface across medium to coarse grained rock. Limonite stains indicate slight weathering.
IM2516	C-29	Dip angle 15° ; plane smooth surface across fine grained crystalline calcite of low hardness and strength. Fresh surface.
IM2517	C-132	Dip angle 5° ; rough undulating surface across medium to coarse grained interlocking granular textured rock. Fresh surface.
IM2518	C-144	Dip angle 10° ; rough plane surface, moderately to highly weathered along fractured surface with extensive development of limonite on exposed surface. Fine grained weathered rock.

<p style="text-align: center;">U. S. ARMY ENGINEER DIVISION LABORATORY, SOUTH ATLANTIC CORPS OF ENGINEERS MARIETTA, GEORGIA</p>		<p style="text-align: center;">DISTRICT Savannah</p> <p style="text-align: center;">PROJECT Trotters Shoals</p> <p style="text-align: center;">CONTRACT NO.</p>			
<p style="text-align: center;">GENERAL TEST REPORT (ROCK CORES)</p>		<p style="text-align: center;">DATE REPORTED 23 July 1970</p> <p style="text-align: center;">WORK ORDER NO. 6401</p>			
<p style="text-align: center;">DESCRIPTION Six NX and one 1 7/8 in. Dia. Rock Cores</p>		<p style="text-align: center;">REQN. NO. SAS-ENG-TROT-11</p>			
<p style="text-align: center;">SOURCE Job Site</p>		<p style="text-align: center;">BASE UNIT COST</p>			
<p style="text-align: center;">FOR USE AS:</p>		<p style="text-align: center;">DATE SAMPLE RECEIVED 5-13-70</p>			
<p style="text-align: center;">TESTED FOR: Specific Gravity, Unconfined Compressive Strength, Poissons Ratio, Static and Dynamic Modulus of Elasticity</p>		<p style="text-align: center;">LAB NO. See below</p>			
<p style="text-align: center;">→ <input type="checkbox"/> MEETS SPECIFICATIONS</p>		<p style="text-align: center;">→ <input type="checkbox"/> FAILS SPECIFICATIONS (See below)</p>			
		<p style="text-align: center;">Unconfined Compressive Strength PSI (H/D = 2)</p>		<p style="text-align: center;">Modulus of Elasticity PSI X 10⁶</p>	
<u>Lab No.</u>	<u>Hole No.</u>	<u>Bulk Specific Gravity</u>	<u>Poissons Ratio</u>	<u>Static (Initial Tangent)</u>	<u>Dynamic</u>
1M2512	C-146	2.94	23,550	0.29	7.14
1M2513	C-130	2.70	26,720	0.24	5.20
1M2514	C-7	3.04	10,960	0.21	12.90
1M2515	C-129	2.70	31,940	0.30	5.20
1M2516	C-29	3.02	25,930	0.25	13.79
1M2517	C-132	2.70	34,350	0.25	3.18
1M2518	C-144	2.72	16,540	0.21	5.97
<p>REMARKS: *Sample contained healed fractures which probably interfered with frequency reading.</p>					
REPORTED BY:	<input type="checkbox"/> PHONE <input type="checkbox"/> WIRE		TESTED BY JWL, HLM	CHECKED BY GVJ	
DATE:			SAMPLED BY		

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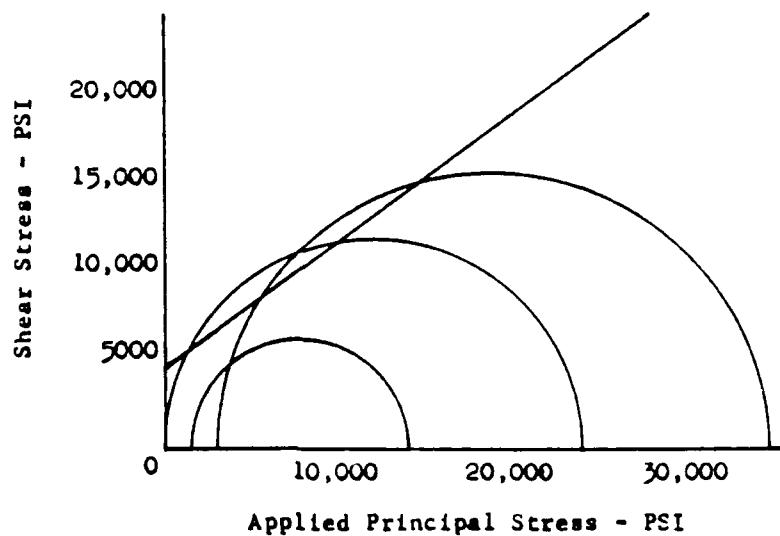
Reqn. No. SAS-ENG-TROT-11
W. O. No. 6401

Trotters Shoals Dam - Savannah District

TRIAXIAL TEST DATA

Lab. No. 1M2512, Hole No. C-146, Depth 20.5' - 22.2'

Min. Principal Stress (Confining Pressure) PSI: 0 1500 3000
Max. Principal Stress, PSI: 23,550 12,280 31,130
Angle of Internal Friction 36°
Shear Stress Intercept: 4600 psi



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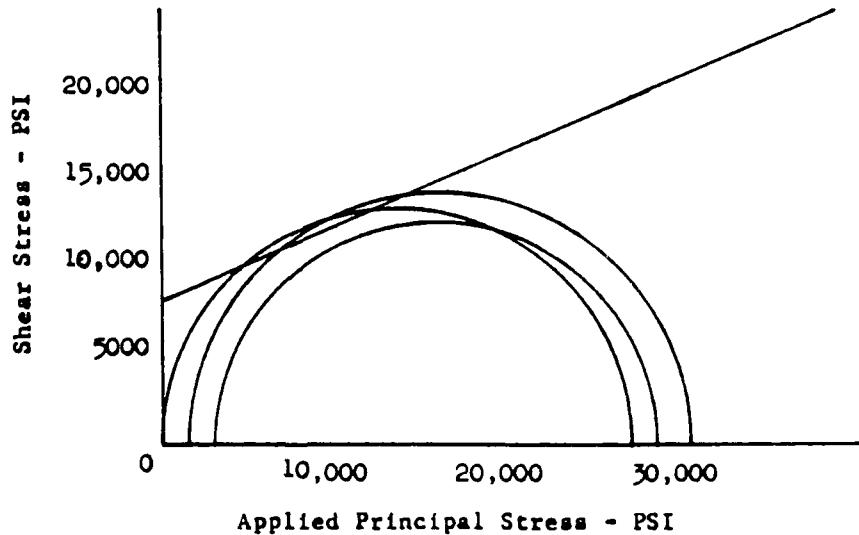
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W. O. No. 6401

Trotters Shoals Dam - Savannah District

TRIAXIAL TEST DATA

Lab. No. 1M2513, Hole No. C-130, Depth 27.3' - 29.4'

Min. Principal Stress (Confining Pressure) PSI:	0	1500	3000
Max. Principal Stress, PSI:	26,720	28,740	25,130
Angle of Internal Friction: 23°			
Shear Stress Intercept: 8300 psi			



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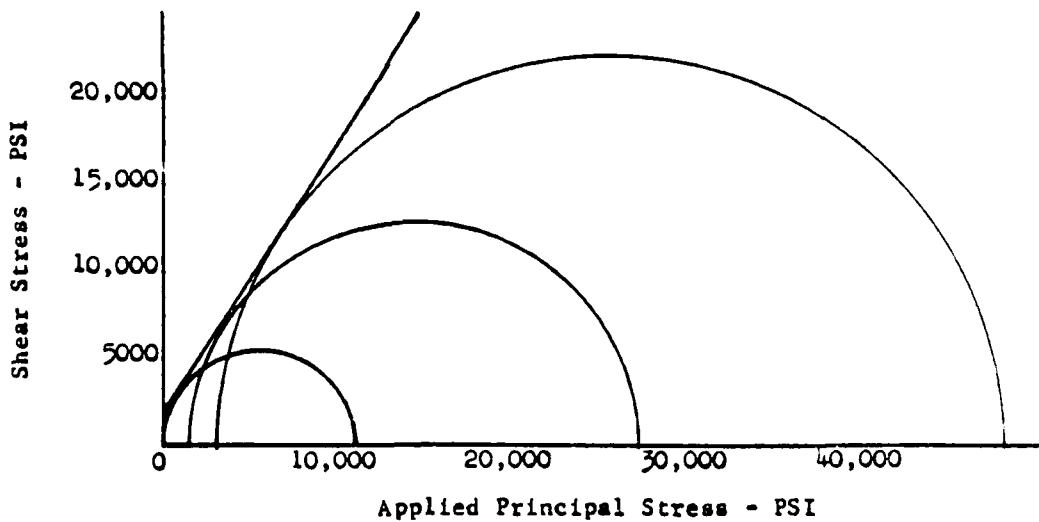
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W. O. No. 6401

Trotters Shoals Dam - Savannah District

TRIAXIAL TEST DATA

Lab. No. 1M2514, Hole No. C-7, Depth 34.5' - 36.3'

Min. Principal Stress (Confining Pressure) PSI:	0	1500	3000
Max. Principal Stress, PSI:	10,960	25,570	45,040
Angle of Internal Friction: 58°			
Shear Stress Intercept: 2000 psi			



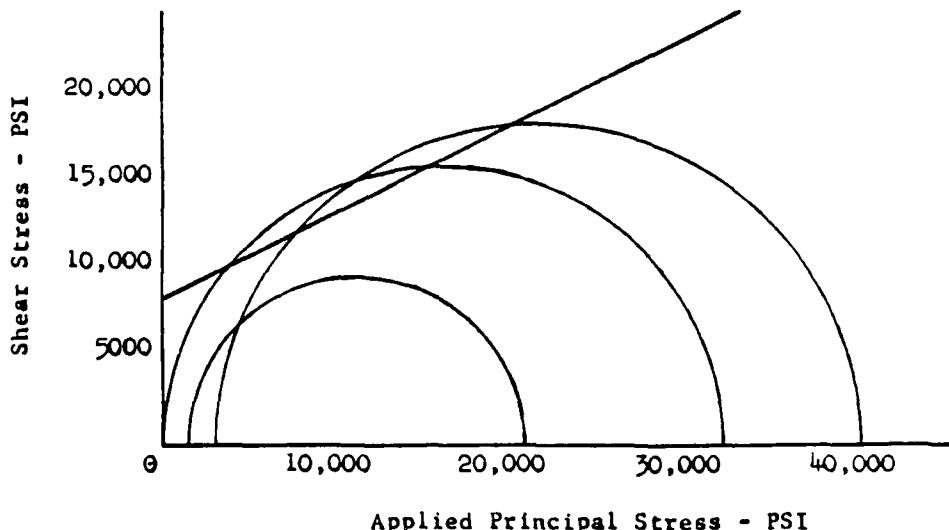
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Reqn. No. SAS-ENG-TROT-11
W. O. No. 6401

Trotters Sheals Dam - Savannah District
TRIAXIAL TEST DATA

Lab. No. 1M2515, Hole No. C-129, Depth 12.9' - 15.5'

Min. Principal Stress (Confining Pressure) PSI: 0 1500 3000
Max. Principal Stress, PSI: 31,940 19,010 36,780
Angle of Internal Friction: 26°
Shear Stress Intercept: 8500 psi



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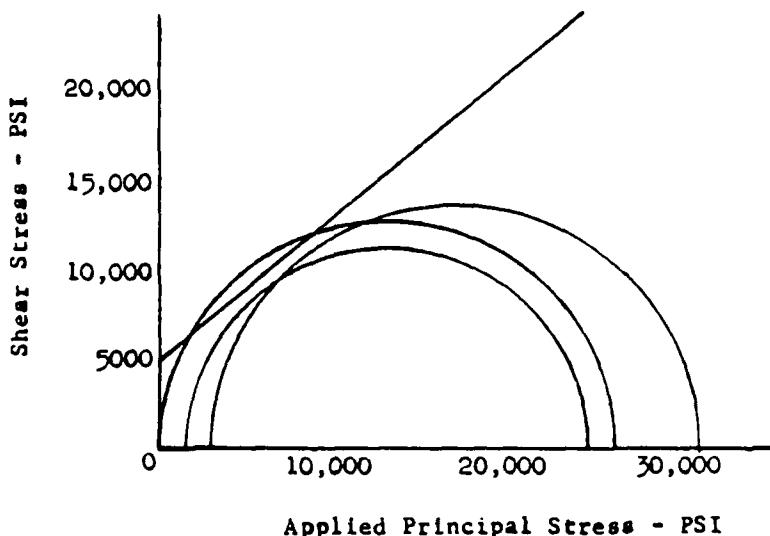
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W. O. No. 6401

Trotters Shoals Dam - Savannah District

TRIAXIAL TEST DATA

Lab. No. 1M2516, Hole No. C-29, Depth 37.7' - 39.8'

Min. Principal Stress (Confining Pressure) PSI:	0	1500	3000
Max. Principal Stress, PSI:	25,930	23,090	27,690
Angle of Internal Friction: 40°			
Shear Stress Intercept: 5000 psi			



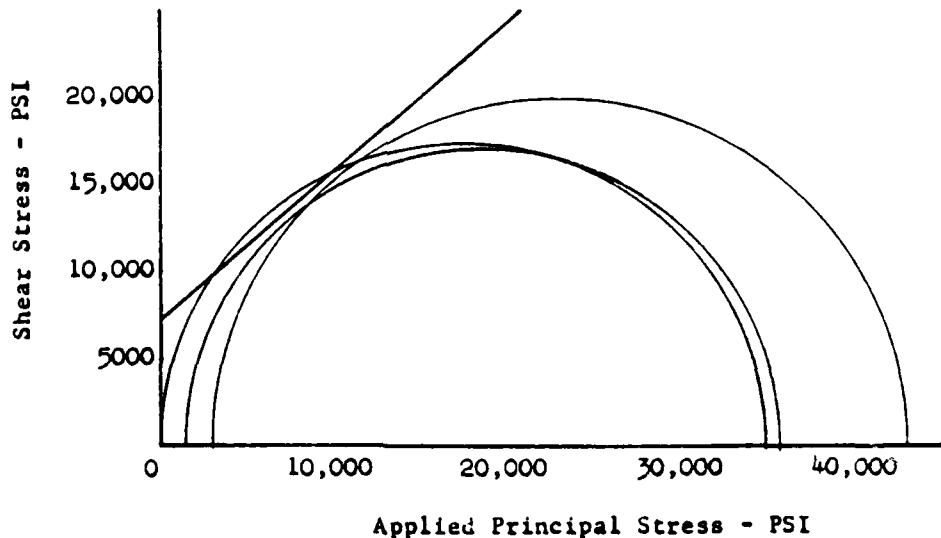
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Reqn. No. SAS-ENG-TROT-11
W. O. No. 6401

Trotters Shoals Dam - Savannah District
TRIAXIAL TEST DATA

Lab. No. 1M2517, Hole No. C-132, Depth 28.4' - 30.9'

Min. Principal Stress (Confining Pressure) PSI:	0	1500	3000
Max. Principal Stress, PSI:	34,350	33,620	39,400
Angle of Internal Friction:	41°		
Shear Stress Intercept:	7300 psi		



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Reqn. No. SAS-ENG-TROT-11
W. O. No. 6401

Trotters Shoals Dam - Savannah District
TRIAXIAL TEST DATA

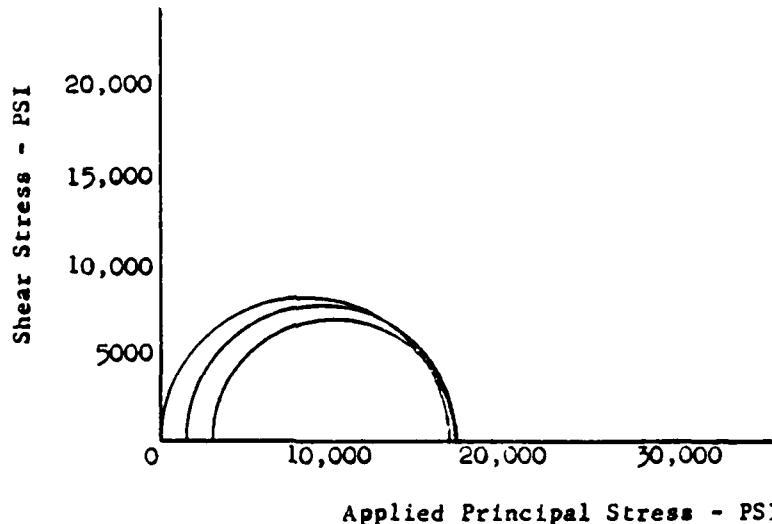
Lab. No. 1M2518, Hole No. C-144, Depth 36.8' - 38.5'

Min. Principal Stress (Confining Pressure) PSI: 0 1500 3000
Max. Principal Stress, PSI: 16,540 15,390 13,600

Angle of Internal Friction:

Shear Stress Intercept:

Note: Lack of correlation between samples probably
due to the variable strength of the steeply
dipping fractures present in the rock.

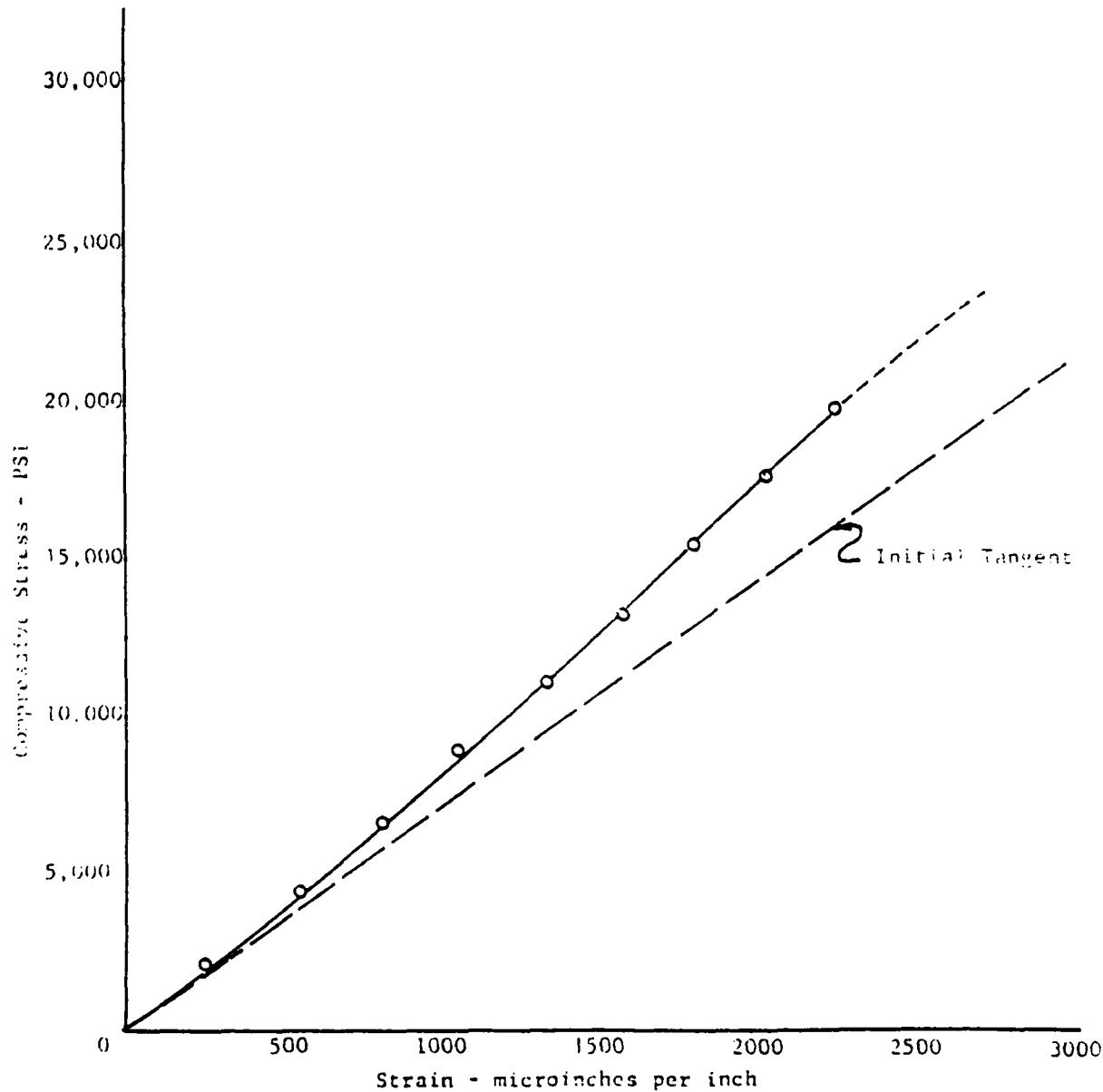


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MARIETTA, GEORGIA

Req. No. SAS-ENG-TROT-11
Work Order No. 6401

Trotters Shoals Dam - Savannah District
Stress-Strain Curve

Lab No. 1M2512, Hole No. C-146, Depth 20.5' - 22.2'

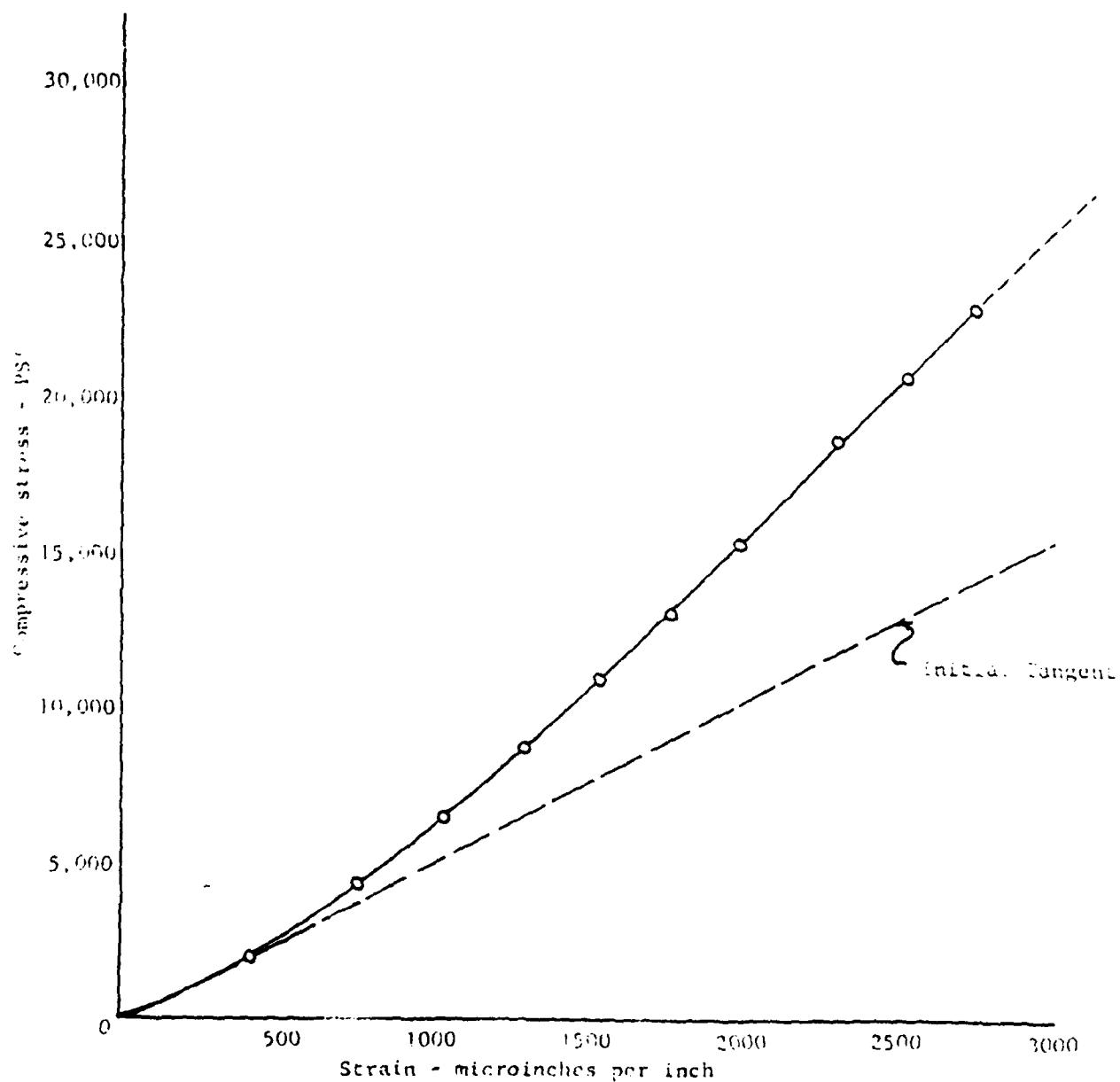


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Req. No. SAS-ENG-TROT-11
Work Order No. 6401

Trotters Shoals Dam - Savannah District
Stress-Strain Curve

Lab No. 1M2513, Hole No. C-130, Depth 27.3' - 29.4'

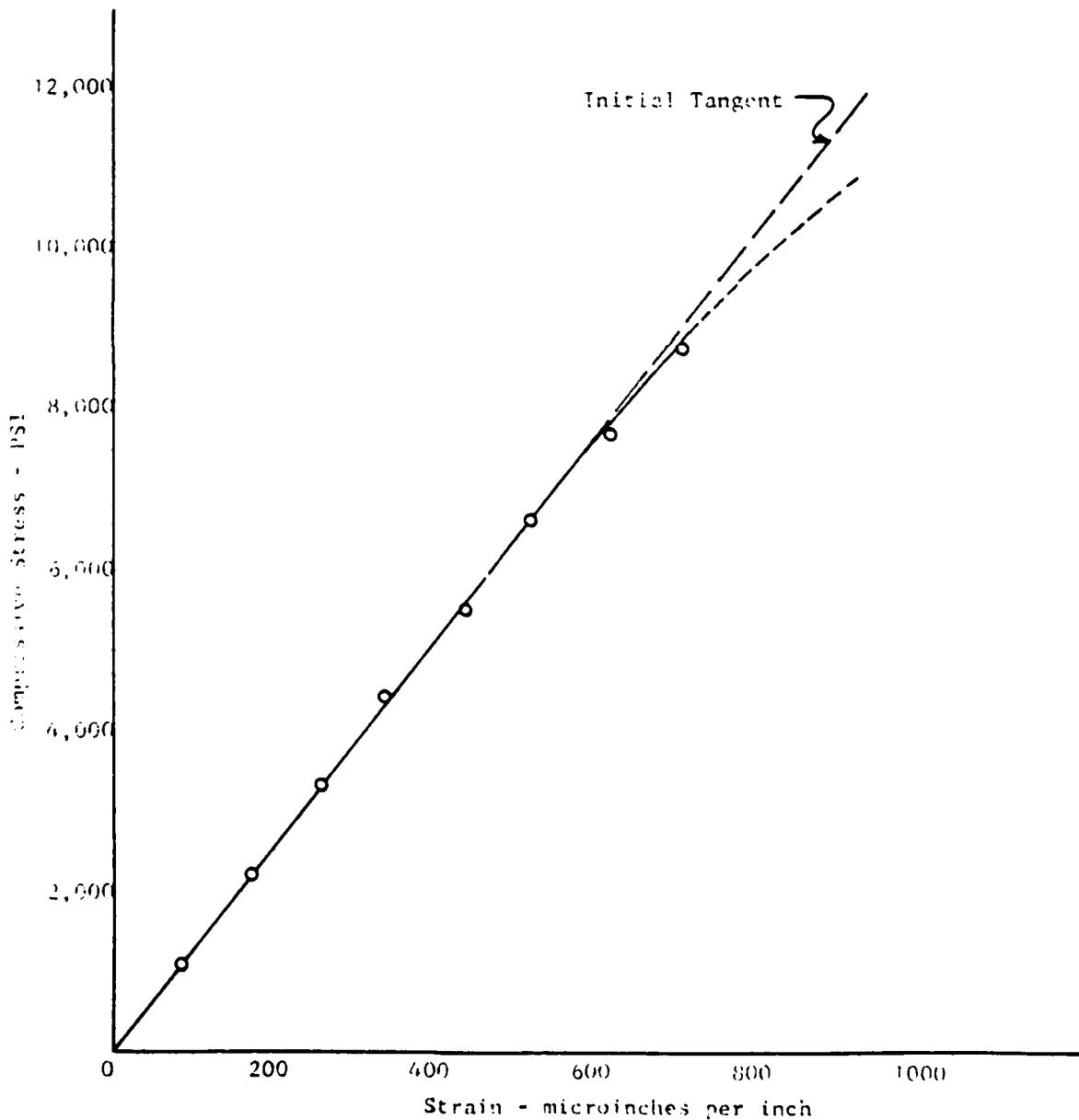


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Reqn. No. SAS-ENG-TROT-11
Work Order No. 6401

Trotters Shoals Dam - Savannah District
Stress-Strain Curve

Lab No. 1M2514, Hole No. C-7, Depth 34.5' - 36.3'

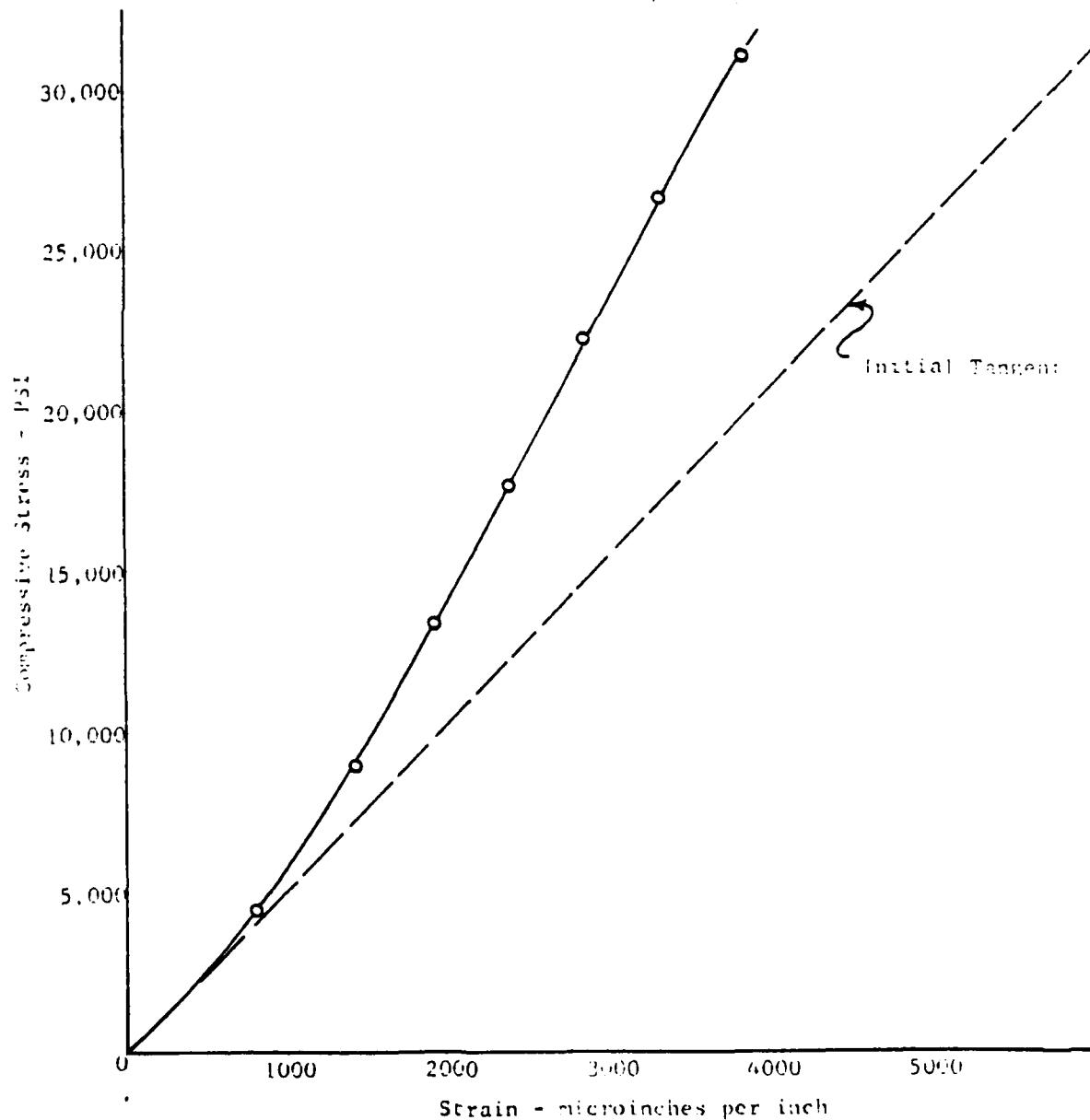


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MARIETTA, GEORGIA

Reqn. No. SAS-ENG-TROT-11
Work Order No. 6401

Trotters Shoals Dam - Savannah District
Stress-Strain Curve

Lab No. 1M2515, Hole No. C-129, Depth 12.9' - 15.5'

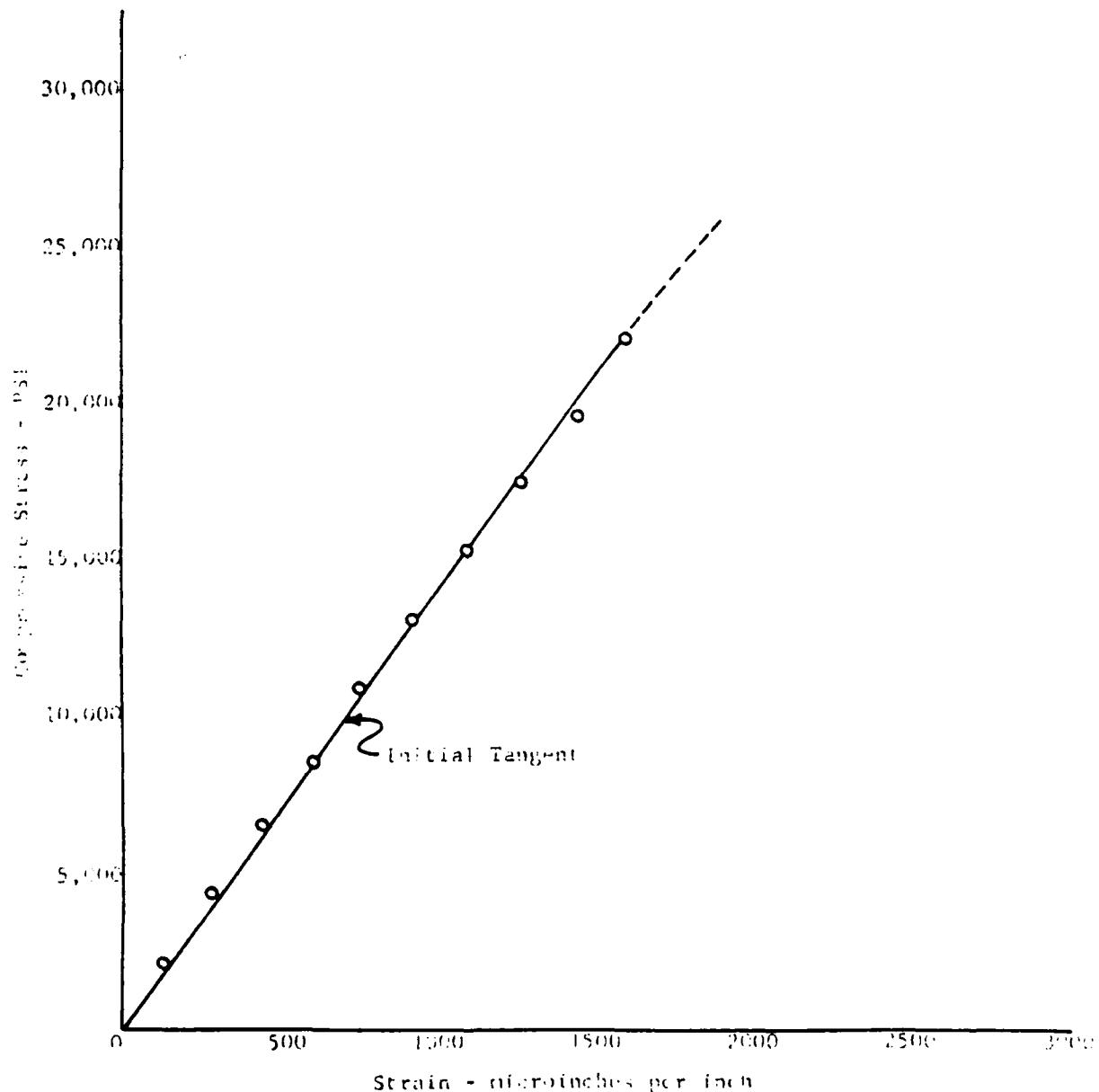


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Req. No. GAS-ENG-TK T-11
Work Order No. 6401

Trotters Shoals Dam - Savannah District
Stress-Strain Curve

Lab No. 1M2516, Hole No. C-29, Depth 37.7' - 39.8'

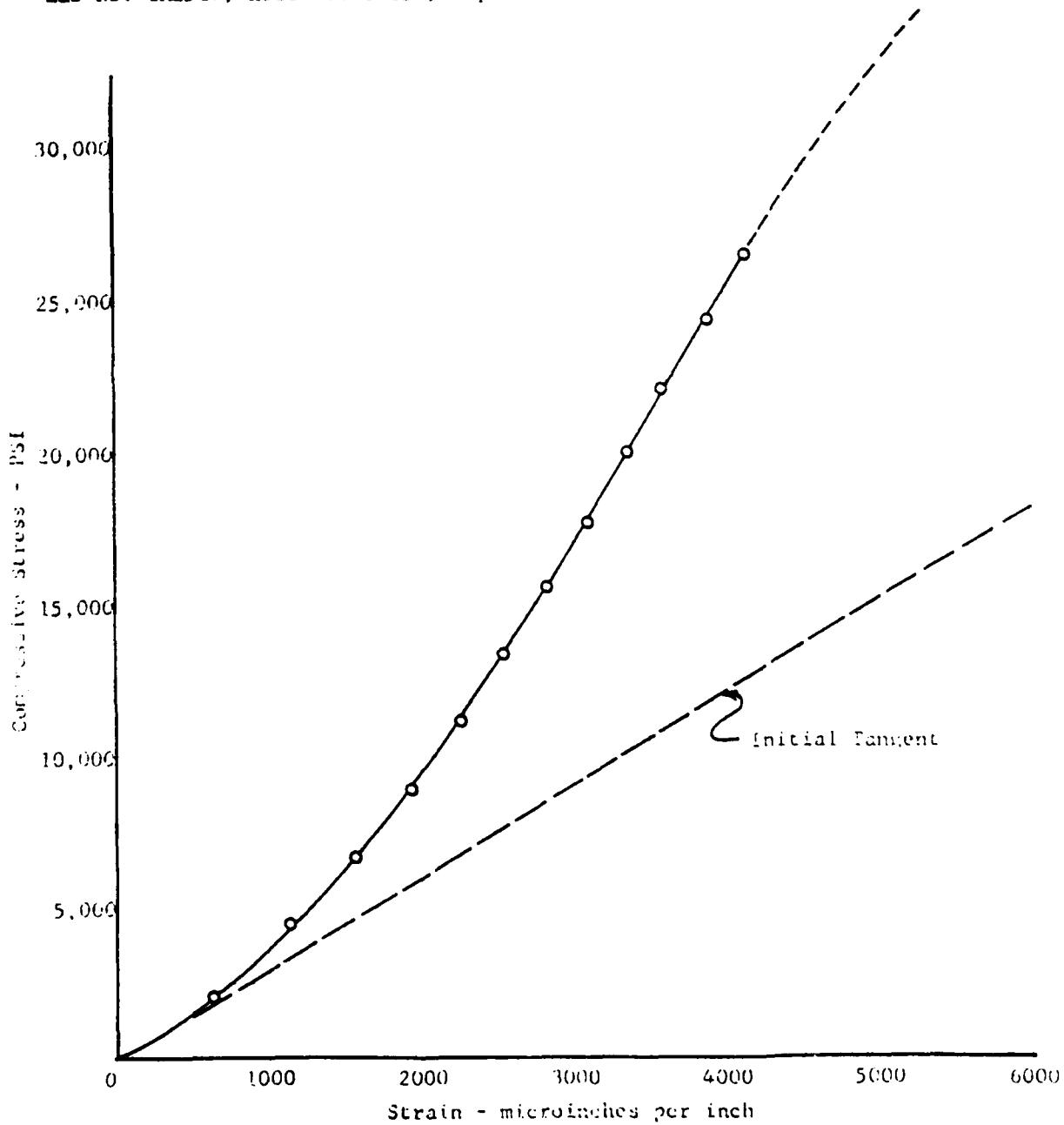


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Req. No. SAS-ENG-TROT-11
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TROTTERS SHOALS DAM - Savannah District
Stress-Strain Curve

Lab No. 1M2517, Hole No. C-132, Depth 28.4' - 30.8'

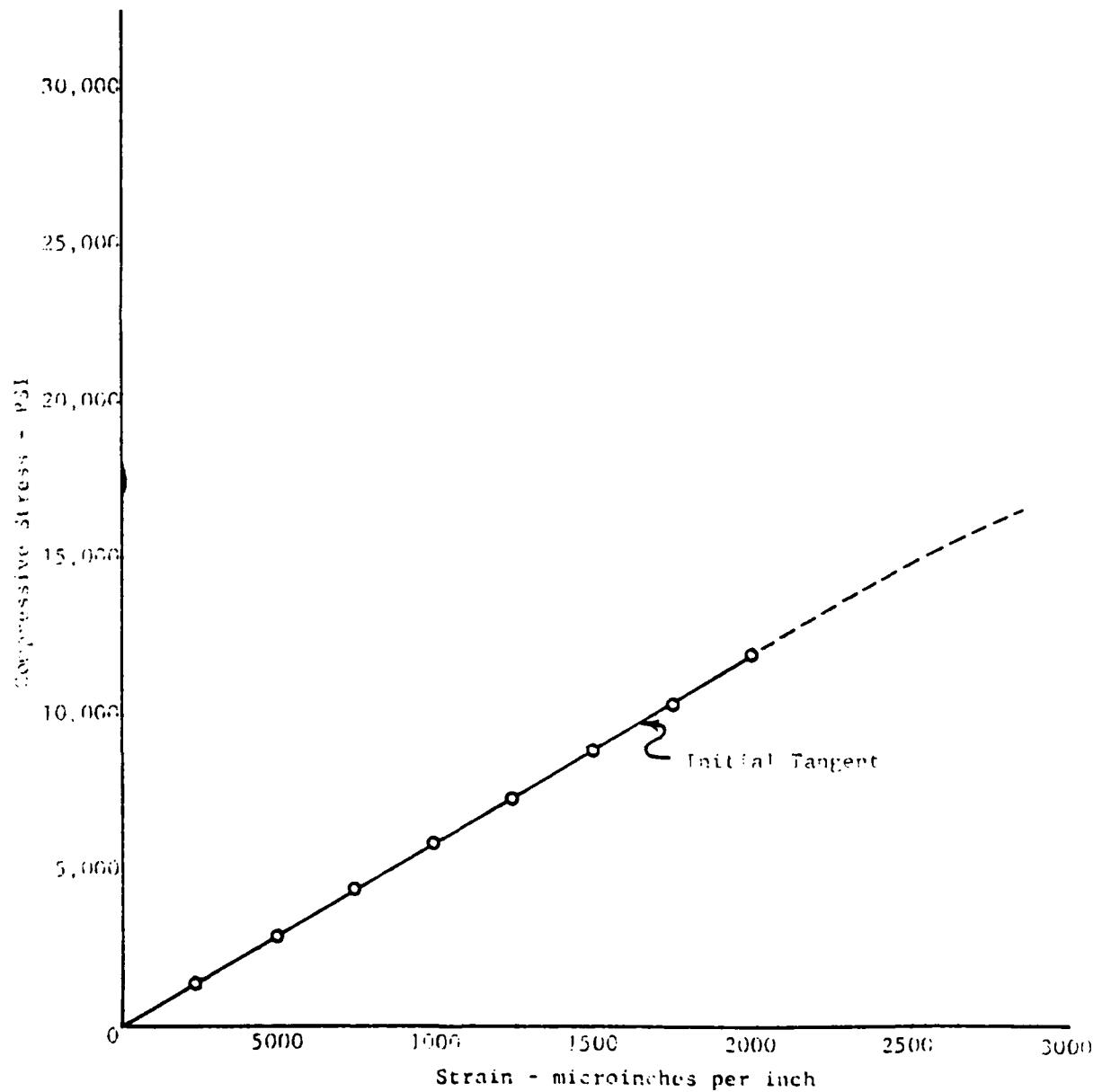


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Trotters Shoals Dam - Savannah District
Stress-Strain Curve

Lab No. 1N2518, Hole No. C-144, Depth 36.8' - 38.5'



APPENDIX B

RICHARD B. RUSSELL - PUMPING RECORDS

APPENDIX B

RBR DAILY PUMPING RECORD

DATE	PRECIP. (IN.)	NO. PUMPS	TOTAL PUMPING (GAL.)	HOURS PUMPED	HOURLY GPM	DAILY GPM (24 HRS.)
1-08-78			Weekend			
1-09-78	Acc. over W/E 1.10	2	6,390,000	72.17	1,476	1,476
1-10-78	0	2	2,202,000	24.17	1,518	1,529
1-11-78	0	2	1,464,000	24.25	1,006	1,016
1-12-78	.42	2	1,903,000	23.17	1,369	1,322
1-13-78						
1-14-78			Weekend			
1-15-78			Weekend			
1-16-78	W/E 0.60	1	4,734,000	96.16	420	322
1-17-78	0.56	1/2 Day Shutdown				
1-18-78	0.03	3	3,456,000	36	1,600	1,200
1-19-78	1.29					
1-20-78		3	12,105,000	47.83	4,218	4,200
1-21-78						
1-22-78						
1-23-78		2	5,927,000	71.7	1,377	1,372
1-24-78	1.55	2	1,513,000	24.1	1,046	1,051
1-25-78	1.31					
1-26-78		3	7,651,500	47.9	2,660	2,657
1-27-78		3	4,087,500	24.25	2,809	2,830

APPENDIX B (CONTINUED)

RBR DAILY PUMPING RECORD

DATE	PRECIP. (IN.)	NO. PUMPS	TOTAL PUMPING (GAL.)	HOURS PUMPED	HOURLY GPM	DAILY GPM (24 HRS.)
1-28-78						
1-29-78						
1-30-78		3	6,516,000	71.15	1,526	1,508
1-31-78						
2-1-78	0.15	2	3,249,000	48.40	1,118	1,128
2-2-78		2	1,970,000	24.33	1,349	1,368
2-3-78		2	1,778,000	23.80	1,243	1,235
2-4-78						
2-5-78						
2-6-78		2	4,871,000	71.70	1,132	1,128
2-7-78		2	1,416,000	24.80	952	983
2-8-78	Trace Snow	2	1,500,000	23.72	1,054	1,042
2-9-78		2	1,481,000	23.78	1,038	1,028
2-10-78		2	1,614,000	23.00	1,170	1,121
2-11-78						
2-12-78						
2-13-78	0.23					
2-14-78		2	6,273,000	121.1	863	871
2-15-78		2	1,517,000	24.16	1,046	1,053
2-16-78	0.02	2	1,507,000	23.77	1,057	1,047

APPENDIX B (CONTINUED)

RBR DAILY PUMPING RECORD

DATE	PRECIP. (IN.)	NO. PUMPS	TOTAL PUMPING (GAL.)	HOURS PUMPED	HOURLY GPM	DAILY GPM (24 HRS.)
2-17-78						
2-18-78						
2-19-78						
2-20-78		2	5,793,000	96.11	1,005	1,006
2-21-78	Snow 0.03	2	1,283,000	23.62	905	321
2-22-78		2	1,466,000	24.33	1,004	1,018
2-23-78		2	1,403,000	23.76	988	974
2-24-78		2	1,480,000	24.22	1,018	1,023
2-25-78						
2-26-78						
2-27-78	0.13					
2-28-78	0.22	2	5,250,000	96.03	911	911
3-1-78		2	1,400,000	24.12	967	972
3-2-78	0.55	2	1,345,000	23.75	944	934
3-3-78		2	1,605,000	22.97	1,165	1,115
3-4-78						
3-5-78						
3-6-78		2	4,056,000	71.75	942	939
3-7-78	0.27	2	1,448,000	25.00	965	1,006
3-8-78	0.17	2	1,422,000	24.50	967	988

APPENDIX B (CONTINUED)

RBR DAILY PUMPING RECORD

DATE	PRECIP. (IN.)	NO. PUMPS	TOTAL PUMPING (GAL.)	HOURS PUMPED	HOURLY GPM	DAILY GPM (24 HRS.)
3-9-78	1.25					
3-10-78	Weekend	2	3,491,000	47.5	1,225	1,212
3-11-78	Weekend	2	1,352,000	22.0	1,024	939
3-12-78	.10					
3-13-78	0	2	3,239,000	49.0	1,102	1,105
3-14-78	.12	2	1,329,000	25.25	877	920
3-15-78	0	2	904,000	23.75	634	628
3-16-78	0	2	868,000	24.25	597	602
3-17-78	0	2	946,000	24.0	637	637
3-18-78	0	2	424,000	20.5	345	244
3-19-78	0					
3-20-78	0	2	3,670,000	50.75	1,205	1,274
3-21-78	0	2	1,540,000	24.25	1,058	1,062
3-22-78	0	2	666,000	25.0	444	460
3-23-78	0	2	1,723,000	22.6	1,271	1,197
3-24-78	.25	2	1,421,000	25.0	947	987
3-25-78	.46	2	1,356,000	22.8	901	942
3-26-78	0					
3-27-78	0	2	2,944,000	48.75	1,006	1,022
3-28-78	0	2	1,426,000	24.0	933	933

APPENDIX B (CONTINUED)

RBR DAILY PUMPING RECORD

DATE	PRECIP. (IN.)	NO. PUMPS	TOTAL PUMPING (GAL.)	HOURS PUMPED	HOURLY GPM	DAILY GPM (24 HRS.)
3-29-78	0	2	1,403,000	24.4	958	974
3-30-78	0	2	1,332,000	23.7	937	925
4-1-78	0	2	1,140	21.8	872	792
4-2-78	0					
4-3-78	0		2,570,000	49.75	861	992
4-4-78	0	2	1,304,000	24.0	906	906
4-5-78	0	2	1,289,000	24.5	877	995
4-6-78	0	2	1,370,000	24.0	951	951
4-7-78	0	2	1,183,000	23.5	839	922
4-8-78	0					
4-9-78	0					
4-10-78	0	2	3,040,000	72.25	701	704
4-11-78	.23	2	1,613,000			
4-12-78	.56	2	2,964,000	23.2	2,129	2,058
4-13-78	.12	2	1,647,000	24.2	1,134	1,144
4-14-78	0	2	1,323,000	23.8	926	919
4-15-78	0	2	1,097,000	23.4	781	762
4-16-78	0					
4-17-78	0					

APPENDIX B (CONTINUED)

RBR DAILY PUMPING RECORD

DATE	PRECIP. (IN.)	NO. PUMPS	TOTAL PUMPING (CAL.)	HOURS PUMPED	HOURLY GPM	DAILY GPM (24 HRS.)
4-18-78	0.52	2	3,860,000	72.7	885	894
4-19-78	0	2	1,360,000	23.7	956	944
4-20-78	0	2	1,234,000	24.0	857	857
4-21-78	0	2	1,261,000	23.9	879	876
4-22-78	0	2	1,086,000	21.15	858	754
4-23-78	0				.	
4-24-78	0.41	2	2,610,000	51.03	852	906
4-25-78	0.49					
4-26-78	0.14					
4-27-78	0	2	4,628,000	72.1	1,060	1,071
4-28-78	0	2	1,382,000	24.0	960	960
4-29-78	0	2	1,209,000	22.0	916	840
4-30-78	0.83					
5-1-78	0.53					
5-2-78	0	2	4,933,000	74.0	1,111	1,142
5-3-78	0.34	2	1,837,000	24.3	1,260	1,276
5-4-78	0.35	2	1,680,000	22.0	1,273	1,167
5-5-78	0	3, 6" Pumps 1, 10" Pumps	2,845,500	25.7	1,845	1,976
5-6-78						
5-7-78	0.16					

APPENDIX B (CONTINUED)

RBR DAILY PUMPING RECORD

DATE	PRECIP. (IN.)	NO. PUMPS	TOTAL PUMPING (GAL.)	HOURS PUMPED	HOURLY GPM	DAILY GPM (24 HRS.)
5-8-78	1.0+	3-6"	3,099,000	71.2	725	717
5-9-78	0.02	3-6"	1,879,500	24.8	1,263	1,305
5-10-78	0.0	3-6"	2,364,000	24.13	1,633	1,642
5-11-78	0.0	3-6"	1,594,000	24.0	1,107	1,107
5-12-78	0.0	3-6"	1,558,000	23.62	1,099	1,082
5-13-78	0.49					
5-14-78	0.0	3-6"				
5-15-78	0.0	3-6"&10"				
5-16-78	0.0	3-6"	5,766,000	96.58	995	1,001
5-17-78	0.0	2-6"	1,226,000	23.35	875	851
5-18-78	0.28	2-6" 10" for 2Sh	2,257,000	23.67	1,589	1,567
5-19-78	0.0					
5-20-78	0.0	2-6"	2,836,000	47.5	995	985
5-21-78	0.0					
5-22-78	0.0	2-6"	2,884,000	49.43	972	1,001
5-23-78	0.0	2-6"	1,374,000	24.13	949	954
5-24-78	0.03	2-6"	1,604,000	24.23	1,103	1,114
5-25-78	0.0	2-6"	1,504,000	24.12	1,039	1,044
5-26-78	0.01	2-6"	1,451,000	22.92	1,055	1,008
5-27-78	0.00	2-6"	1,352,000	22.67	994	939

APPENDIX B (CONTINUED)

RBR DAILY PUMPING RECORD

DATE	PRECIP. (IN.)	NO. PUMPS	TOTAL PUMPING (GAL.)	HOURS PUMPED	HOURLY GPM	DAILY GPM (24 HRS.)
5-28-78						
5-29-78						
5-30-78	0.0	2-6"	5,044,000	73.27	1,147	1,168
5-31-78	0.0	2-6" 10" INT.	1,440,000	24.4	984	1,000
6-1-78	0.0	10"	1,560,000	24.17	1,076	1,083
6-2-78	0.0	2-6"	1,551,000	23.92	1,081	1,077
6-3-78	0.0	2-6"	1,188,000	21.67	914	825
6-4-78	0.0					
6-5-78	0.0	2-6"	2,944,000	50.75	967	1,022
6-6-78	0.92	2-6"	1,259,000	23.5	893	874
6-7-78	0.66	2-6"	1,475,000	22.33	1,101	1,023
6-8-78	1.61	2-6" 1-10" 4 Hr	3,138,000	25.7	1,235	1,179
6-9-78	0.0	2-6" 1-10"	3,828,000	23.17	1,654	2,658
6-10-78	0.0			overlap of data		
6-11-78	0.0					
6-12-78	0.03	2-6"	6,552,000	95.8	1,140	1,138
6-13-78	0.0	2-6"	1,391,000	24.12	961	966
6-14-78	0.0	2-6"	1,555,000	24.22	1,070	1,080
6-15-78	0.0	2-6"	1,361,000	23.65	950	945
6-16-78	0.0	2-6"	1,464,000	24.27	1,005	1,017

APPENDIX B (CONTINUED)

RBR DAILY PUMPING RECORD

DATE	PRECIP. (IN.)	NO. PUMPS	TOTAL PUMPING (GAL.)	HOURS PUMPED	HOURLY GPM	DAILY GPM (24 HRS.)
6-17-78	0.0	2-6"				
6-18-78	0.0					
6-19-78	0.0	2-6"	4,083,000	70.58	964	945
6-20-78	0.0	2-6"	1,389,000	25.67	902	965
6-21-78	0.0					
6-22-78	0.0	2-6"	2,652,000	47.12	938	921
6-23-78	0.0	2-6"	1,337,000	24.37	914	923

APPENDIX C

CONCRETE DAM DRILLING AND GROUTING SUMMARY

APPENDIX C

CONCRETE DAM
DRILLING AND GROUTING

SUMMARY

1. Feet Drilled 32636 ft.
2. Grout Volume 1209.7 cubic ft.
3. Volume Per Linear Foot 0.04 c.f./ft.
4. High Takes 635.90 cubic ft.

APPENDIX C (CONTINUED)
DRILLING AND GROUTING SUMMATION

Right Abutment Station 00+00, 03+36

	<u>FOOTAGE DRILLED</u>	<u>GROUT PLACED</u>	<u>GROUT DISTRIBUTION</u>
Line A, Zone 1			
<u>0-41 Feet</u>			
Primary	656 (199.85)	63.1 (1.79)	.0962 (.0089)
Secondary	656 (199.95)	8.6 (.24)	.0131 (.0012)
Tertiary	1230 (374.90)	9.5 (.27)	.0077 (.0007)
Quaternary	369 (112.47)	24.1 (.68)	.0653 (.0060)
Line A, Zone II			
<u>41-82 Feet</u>			
Primary	656 (199.95)	81.9 (2.32)	.1248 (.0116)
Secondary	656 (199.95)	13.9 (.39)	.0212 (.0020)
Tertiary	369 (112.47)	19.9 (.56)	.0539 (.0056)
Quaternary	246 (74.98)	1.4 (.04)	.0057 (.00057)
<u>Line A, Zone III</u>			
Primary	656 (199.95)	85.6 (2.42)	.1305 (.0121)
Secondary	369 (112.47)	28.6 (.81)	.0775 (.0072)
Tertiary	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Quaternary	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

* Parenthesis represent metric conversions.

APPENDIX C (CONTINUED)
DRILLING AND GROUTING SUMMATION

Intake Section Station 03+36, 09+35.5

	<u>FOOTAGE DRILLED</u>	<u>GROUT PLACED</u>	<u>GROUT DISTRIBUTION</u>
Line A, Zone 1			
<u>0-41 Feet</u>			
Primary	1230 (374.90)	163.4 (4.63)	.1328 (.0123)
Secondary	1230 (374.90)	34.4 (4.98)	.0282 (.0026)
Tertiary	2460 (749.81)	19.5 (.55)	.0079 (.0007)
Quaternary	369 (112.47)	11.2 (.32)	.0303 (.0028)
Line A, Zone II			
<u>41-82 Feet</u>			
Primary	1230 (374.90)	18.0 (.51)	.0146 (.0014)
Secondary	1230 (374.90)	10.8 (.31)	.0088 (.0008)
Tertiary	246 (74.98)	2.6 (.07)	.0106 (.0010)
Quaternary	164 (50.00)	1.9 (.05)	.0116 (.0011)
<u>Line A, Zone III</u>			
Primary	1230 (374.90)	7.6 (.21)	.0062 (.0006)
Secondary	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Tertiary	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Quaternary	82 (24.99)	0.4 (.01)	.0049 (.0004)

APPENDIX C (CONTINUED)
DRILLING AND GROUTING SUMMATION

Spillway Section Station 09+35.5, 15+95.5

	<u>FOOTAGE DRILLED</u>	<u>GROUT PLACED</u>	<u>GROUT DISTRIBUTION</u>
Line A, Zone 1			
<u>0-41 Feet</u>			
Primary	1435 (437.39)	177.80 (5.03)	.1239 (.0115)
Secondary	1394 (424.89)	36.3 (1.03)	.0260 (.0024)
Tertiary	2829 (862.28)	72.1 (2.04)	.0255 (.0024)
Quaternary	779 (237.44)	46.3 (1.31)	.0594 (.0055)
Line A, Zone II			
<u>41-82 Feet</u>			
Primary	1435 (437.39)	53.8 (1.52)	.0375 (.0035)
Secondary	1394 (424.89)	12.6 (.36)	.0090 (.0008)
Tertiary	328 (99.97)	1.6 (.04)	.0049 (.0004)
Quaternary	41 (12.50)	0.1 (.003)	.0024 (.0002)
Line A, Zone III			
<u>82-123 Feet</u>			
Primary	1435 (437.39)	36.7 (1.04)	.0256 (.0024)
Secondary	1394 (424.89)	12.6 (.36)	.0090 (.0008)
Tertiary	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Quaternary	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

APPENDIX C (CONTINUED)
DRILLING AND GROUTING SUMMATION

Left Abutment Station 15+95.5, 18+83.5

	<u>FOOTAGE DRILLED</u>	<u>GROUT PLACED</u>	<u>GROUT DISTRIBUTION</u>
Line A, Zone 1			
<u>0-41 Feet</u>			
Primary	574 (174.95)	84.3 (2.39)	.1469 (.0137)
Secondary	615 (187.45)	24.7 (.70)	.0402 (.0037)
Tertiary	1271 (387.40)	16.0 (.45)	.0126 (.0012)
Quaternary	451 (137.46)	7.1 (.20)	.0157 (.0015)
Line A, Zone II			
<u>41-82 Feet</u>			
Primary	574 (174.95)	3.3 (.09)	.0057 (.0005)
Secondary	615 (187.45)	9.1 (.26)	.0148 (.0014)
Tertiary	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Quaternary	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Line A, Zone III			
<u>82-123 Feet</u>			
Primary	574 (174.95)	8.2 (.23)	.0143 (.0013)
Secondary	164 (50.0)	0.4 (.01)	.0024 (.0002)
Tertiary	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
Quaternary	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

APPENDIX C (CONTINUED)

HIGH TAKES

<u>STATION</u>	<u>GROUT VOLUME C.F.</u>	<u>TYPE HOLE</u>	<u>ZONE</u>
00+56	13.9	T	2
00+61	14.2	S	3
00+81	58.1	P	3
01+20	17.5	P	1
01+20	60.3	P	2
02+18	12.8	Q	1
02+20	12.0	P	1
03+39	88.5	P	1
03+48	24.7	S	1
09+20	49.0	P	1
09+45	34.8	T	1
09+59	44.3	P	1
09+59D	18.9	P	1
10+17	22.6	P	2
10+97	24.9	P	1
11+17	30.0	P	1
12+02	11.0	T	1
15+71	11.5	P	1
15+81	20.3	S	1
16+93	55.9	P	1
17+33	10.7	P	1

APPENDIX C (CONTINUED)

NUMBER OF CROUT HOLES ACCEPTING 4 DIFFERENT RANGES OF CROUT VOLUME

	<u>0-3 c.f.</u>	<u>3-5 c.f.</u>	<u>5-8 c.f.</u>	<u>>8 c.f.</u>	Total Grout (c.f.)
	<u>Number of Holes</u>	<u>Number of Holes</u>	<u>Number of Holes</u>	<u>Number of Holes</u>	
PRA (Primary Right Abutment)					
1	10	1	2	3	63.1
2	14	1	1	1	81.0
3	12	1	1	2	85.6
PI (Primary Intake)					
1	25	1	2	2	163.4
2	27	2	1	0	18.0
3	30	0	0	0	-
PSW (Primary Spillway)					
1	25	1	3	5	17.5
2	31	2	1	1	50.0
3	32	1	1	1	30.0
PLA (Primary Left Abutment)					
1	9	1	2	2	24.3
2	14	0	0	0	14.0
3	14	0	0	0	8.0

APPENDIX C (CONTINUED)

NUMBER OF GROUT HOLES ACCEPTING 4 DIFFERENT RANGES OF GROUT VOLUME

	<u>0-3 c.f.</u>	<u>3-5 c.f.</u>	<u>5-8 c.f.</u>	<u>>8 c.f.</u>	Total Crout (c.f.)
	<u>Number of Holes</u>	<u>Number of Holes</u>	<u>Number of Holes</u>	<u>Number of Holes</u>	
<u>SRA (Secondary Right Abutment)</u>					
1	16	0	0	0	3.6
2	15	1	0	0	13.2
3	6	0	2	1	28.6
<u>SI (Secondary Intake)</u>					
1	30	0	0	1	34.7
2	30	0	0	0	16.2
3	0	0	0	0	0
<u>SSW (Secondary Spillway)</u>					
1	31	0	2	1	3
2	33	1	0	0	17
3	2	0	0	0	0
<u>SLA (Secondary Left Abutment)</u>					
1	12	1	1	1	24.7
2	14	0	1	0	15
3	4	0	0	0	0

APPENDIX C (CONTINUED)

NUMBER OF GROUT HOLES ACCEPTING 4 DIFFERENT RANGES OF GROUT VOLUME

	<u>0-3 c.f.</u>	<u>3-5 c.f.</u>	<u>5-8 c.f.</u>	<u>>8 c.f.</u>	Total Grout (c.f.)
	<u>Number of Holes</u>	<u>Number of Holes</u>	<u>Number of Holes</u>	<u>Number of Holes</u>	

TRA (Tertiary Right Abutment)

1	30	0	0	0	1.5
2	8	0	0	1	19.2
3	0	0	0	0	0.0

TI (Tertiary Intake)

1	59	0	0	0	19.5
2	6	0	0	0	2.1
3	0	0	0	0	0.0

TSW (Tertiary Spillway)

1	30	1	0	0	1.5
2	0	0	0	0	0.0
3	0	0	0	0	0.0

APPENDIX C (CONTINUED)

NUMBER OF GROUT HOLES ACCEPTING 4 DIFFERENT RANGES OF GROUT VOLUME

	<u>0-3 c.f.</u>	<u>3-5 c.f.</u>	<u>5-8 c.f.</u>	<u>>8 c.f.</u>	Total Grout (c.f.)
	Number of Holes	Number of Holes	Number of Holes	Number of Holes	

QRA (Quaternary Right Abutment)

1	7	0	0	2	24.1
2	6	0	0	0	1.4
3	0	0	0	0	0.0

QI (Quaternary Intake)

1	7	2	0	0	11.2
2	4	0	0	0	1.7
3	2	0	0	0	0.0

QSW (Quaternary Spillway)

1	18	0	0	1	24.0
2	1	0	0	0	0.0
3	0	0	0	0	0.0

QLA (Quaternary Left Abutment)

1	10	1	0	0	24.1
2	0	0	0	0	0.0
3	0	0	0	0	0.0

APPENDIX C (CONTINUED)

EXCESSIVE GROUT TAKES

<u>HOLE NO.</u>	<u>STAGE *</u>	<u>TAKE</u>	<u>REMARKS</u>
0+06	1	7.1	Fan hole, communicated with 0+10.
0+10	1	14.6	Fan hole, communicated with outside of dam.
0+14	1	7.9	Fan hole, grout leaked from pores in gutter and gallery floor.
0+41	3	5.6	Primary, communicated with tertiary hole already grouted.
0+56	3	13.9	Tertiary.
0+61	3	14.2	Primary, communicated with secondary hole already grouted.
0+81	3	58.1	Primary, communicated with 5 holes, one 100 feet away.
0+86	1	8.3	Tertiary, communicated with adjacent holes.
1+00	1	9.0	Primary, communicated with a drain and M 2/3 joint.
1+20	1	17.5	Primary.
	2	59.4	Primary, communicated with 5 holes, one 60 feet away.
	3	5.4	Secondary.
1+30	3	54.0	Secondary.
1+40	1	6.2	Primary, communicated with adjacent primary.
	2	5.8	Primary.
	3	6.2	Primary.
2+00	3	8.6	Primary, communicated with adjacent primary, pushed water 60 feet away.
2+18	1	12.8	Quaternary, communicated with M 4/5 joint.
2+20	1	12.0	Primary, communicated with next 3 primaries (60 feet).
3+39	1	88.5	Primary, communicated as described in text, page 67, paragraph 3.
3+46	1	22.9	Secondary, communicated with one other hole.
3+82	1	6.2	Primary, communicated with adjacent primary.
6+01	1	6.9	Primary, communicated with drain.
	2	6.0	Primary, communicated with previously grouted tertiary 51 feet away.
9+20	1 EX	49.0	Primary, communicated with 9+40.

APPENDIX C (CONTINUED)

<u>HOLE NO.</u>	<u>STAGE *</u>	<u>TAKE</u>	<u>REMARKS</u>
9+45	1 SUR	34.6	Tertiary, communicated with 3 other holes (2 previously grouted) and a drain.
9+59	1 EX	44.2	Primary.
9+62	1 EX	7.9	Secondary, communicated with 2 other holes.
9+65	1 SUR	18.3	Primary, communicated with 2 other holes and a drain.
9+69	1 EX	6.03	Secondary, communicated with 2 other holes and a drain.
9+77	1 EX	7.4	Primary.
	2	6.45	Primary.
9+97	3	5.36	Primary, communicated with 10+01.
10+17	1 EX	5.1	Primary.
	2	22.6	Primary, communicated with 3 other holes, one 80 feet away.
10+97	1 EX	24.9	Primary, communicated with 2 other holes, one 40 feet away
11+17	1 EX	30.0	Primary, communicated with 11+41.
11+20	1 EX	39.0	Quaternary.
12+02	2 SUR	12.71	Tertiary, showed artesian flow prior to grouting, communicated with next tertiary hole.
15+71	1 SUR	11.29	Primary, intersected IPB pipe.
15+81	1 SUR	20.3	Secondary, communicated with 6 other holes, one 50 feet away.
16+07	1 SUR	6.86	Primary, communicated with next primary hole.
16+93	1 EX	55.35	Primary, communicated as described in text, page 66, paragraph 3.
17+03	1 EX	6.36	Secondary.
17+33	1 SUR	10.7	Primary.

* 1 EX indicates grout placed through pneumatic packer.

1 SUR indicates grout placed through mechanical packer after refusal with pneumatic packer.

1, 2, or 3 without additional notation indicates that the entire zone was grouted in one step through a mechanical packer.

APPENDIX D

EARTH EMBANKMENTS - STEEL FIBROUS SHOTCRETE
CORE SAMPLES

APPENDIX D
EARTH EMBANKMENTS
STEEL FIBROUS SHOTCRETE CORE SAMPLES

<u>CORE NO.</u>	<u>DATE</u>	<u>STATION</u>	<u>OFFSET</u>	<u>THICKNESS (IN.)</u>	<u>REMARKS</u>
1	10/21/80	7+90	U/S Wall	7½	
2	10/21/80	7+80	U/S Wall	4½	
3	10/21/80	7+50	D/S Wall	7	
4	10/17/80	7+25	D/S Wall	4½	
5	10/16/80	7+80	D/S Wall	7	
6	12/12/80	6+85	6' U/S	3½	
7	12/3/80	8+12	18' D/S	4½	
8	12/11/80	9+04	U/S Wall	9	
8A	12/11/80	9+05	U/S Wall	3½	
8B	12/11/80	9+06	U/S Wall	6	
9	12/29/80	6+87	14' U/S	4	
10	12/31/81	7+07	33' U/S	4	
11	1/2/81	6+79	Centerline	4½	
12	1/7/81	7+50	12' D/S	3½	
13	1/8/81	7+22	8' D/S	3½	
14	1/9/81	7+60	Centerline	5	
15	1/13/81	7+25	10' U/S	5	
16	1/19/81	22+00	35' D/S	3½	
17	1/20/81	22+30	63' D/S	3½	
18	1/15/81	7+45	24' U/S	3½	
19	1/16/81	8+43	36' U/S	3½	
20	1/22/81	23+30	86' D/S	6½	
21	1/23/81	22+92	86' D/S	3½	
22	1/26/81	23+35	46' D/S	3	
23	1/27/81	23+30	22' D/S	4½	
24A	1/23/81	22+00	70' D/S	3½	
24B	1/23/81	22+00	72' D/S	3½	
25	1/28/81	22+90	23' D/S	3	
26	1/29/81	22+85	10' U/S	3-3/4	
27	2/2/81	23+25	Centerline	4½	
28	2/9/81	22+60	6' U/S	4½	
29	2/10/81	22+50	10' D/S	2	
30	2/5/81	24+46	-----	4½	
31	2/6/81	24+28	-----	3½	
32	2/11/81	22+50	Centerline	5	
33	2/12/81	22+00	12' D/S	4½	
34	2/13/81	21+85	19' U/S	5	
35	2/16/81	22+00	25' U/S	3½	
36	2/17/81	22+20	30' U/S	3½	
37	2/20/81	22+95	13' U/S	7	
38	2/23/81	22+70	18' U/S	4½	
39	2/24/81	22+00	70' D/S	6½	
40	2/25/81	23+75	Bottom D/S Niche	3	

APPENDIX D (CONTINUED)

<u>CORE NO.</u>	<u>DATE</u>	<u>STATION</u>	<u>OFFSET</u>	<u>THICKNESS (IN.)</u>	<u>REMARKS</u>
41	2/26/81	23+25	-----	3½	
42	2/27/81	21+80	15' D/S	3	
42A	2/27/81	21+80	15' D/S	6	
43	3/2/81	21+70	38' D/S	10½	
44	3/3/81	21+60	14' D/S	4	
45	3/4/81	21+40	18' D/S	3½	
46	3/5/81	21+05	16' D/S	3½	
47	3/6/81	-----	17' U/S	3½	
48	3/9/81	23+78	D/S Niche	11+	
49A	3/10/81	24+02	D/S Niche	10+	
49B	3/11/81	24+62	D/S Niche	11+	
49C	3/11/81	24+46	D/S Niche	11½+	
50	3/11/81	21+00	40' D/S	5	
51	3/12/81	20+83	24' D/S	4½	
52	3/13/81	20+60	8' U/S	3½	
53	-----	-----	-----	-----	Not Taken
54	-----	-----	-----	-----	Not Taken
55	-----	-----	-----	-----	Not Taken
56	-----	-----	-----	-----	Not Taken
57	-----	-----	-----	-----	Not Taken
58	5/27/82	11+25	6' D/S	3½	
59	5/28/82	10+85	15' D/S	3"	
60	6/3/82	10+80	12' D/S	4½	
61	6/4/82	10+70	27' D/S	5½	
62	6/9/82	10+47	6' D/S	5½	
63	6/10/82	10+38	30' D/S	3	
64	6/14/82	9+74	25' D/S	5½	
65	6/15/82	9+75	24' U/S	4	
66	7/1/82	11+58	2' D/S	3½	
67	6/30/82	11+85	3' D/S	4	
68	6/29/82	11+30	40' U/S	4	
69	6/25/82	11+50	40' U/S	4	
70	8/12/82	17+08	95' U/S	3	
71	8/13/82	16+98	95' U/S	3	
72	8/16/82	17+25	75' U/S	5½	
73	8/17/82	17+25	70' U/S	5	
74	8/18/82	17+00	65' U/S	3½	
75	8/19/82	16+88	75' U/S	4	
76	8/20/82	16+30	105' U/S	4½	
77	8/21/82	16+40	95' U/S	3	
78	8/23/82	16+24	80' U/S	3½	
79	8/24/82	16+28	75' U/S	3½	
80	8/25/82	16+28	60' U/S	3	
81	8/26/82	16+58	85' U/S	4½	
82	8/28/82	16+25	105' U/S	3	

APPENDIX D (CONTINUED)

<u>CORE NO.</u>	<u>DATE</u>	<u>STATION</u>	<u>OFFSET</u>	<u>THICKNESS (IN.)</u>	<u>REMARKS</u>
83	8/30/82	15+10	30' U/S	4	
84	8/31/82	15+50	35' D/S	3	
85	9/1/82	15+00	5' D/S	3½	
86	9/2/82	15+00	50' D/S	3	
87	9/3/82	14+30	8' D/S	3½	
88	9/7/82	14+38	25' D/S	3½	
89	9/9/82	15+70	70' U/S	3	
90	9/10/82	15+70	40' U/S	5	
91	9/11/82	17+50	50' U/S	3½	
93	9/14/82	17+65	20' U/S	4½	
94	9/15/82	17+65	30' D/S	3½	
95	9/16/82	17+90	2' U/S	3½	
96	9/17/82	17+80	30' D/S	5	
97	9/18/82	17+25	Centerline	3½	
98	9/20/82	19+25	20' D/S	3	
99	9/21/82	19+40	4' U/S	5½	
100	9/22/82	19+07	20' U/S	3½	
101	9/23/82	18+38	10' D/S	3½	
102	8/24/82	17+70	50' U/S	----	Not Recorded
103	9/24/82	17+25	170' U/S	4½	
104	9/25/82	17+25	90' U/S	3½	
105	9/27/82	16+25	35' U/S	3½	
106	9/28/82	17+00	35' U/S	3	
107	9/29/82	15+37	5' D/S	3	
108	9/30/82	15+65	22' D/S	4	
109	10/1/82	17+21	18' D/S	4	
110	10/2/82	17+18	9' U/S	5	
111	10/4/82	16+81	40' D/S	3	
112	10/5/82	15+76	45' D/S	4½	
113	10/6/82	16+00	50' D/S	3½	
114	10/7/82	16+25	45' D/S	4	
115	10/15/82	13+90	35' D/S	4½	
116	10/18/82	14+00	20' U/S	4½	

APPENDIX E

UNCONFINED COMPRESSION TESTING OF STEEL FIBROUS
SHOTCRETE CORE SAMPLES

APPENDIX E

UNCONFINED COMPRESSION TESTING
OF STEEL FIBROUS SHOTCRETE CORE SAMPLES

CORE NO.

COMPRESSIVE STRENGTH (PSI) AT AGE (DAYS)

	<u>7</u>	<u>14</u>	<u>28</u>	<u>56</u>	<u>1 Year</u>	<u>3 Year</u>
1				6820		
3				6570		
4						7330
5						5480
6	2340					
8	2470					
8B			2950			
9		6170				
10		5560		.		
12						6555
14		5400				
15	3090					
16		4834				
19			2905			
21	5043					
23	5159					
25		4489				
26	5508					
27	4133					
30			6028			
32		5015				
36	4440					
103					7240	
104					4865	
116					3980	

APPENDIX F

EARTH EMBANKMENTS - SHOTCRETE BEAM FLEXURE
TEST RESULTS

APPENDIX F

EARTH EMBANKMENTS
SHOTCRETE BEAM FLEXURE TEST RESULTS

FLEXURE STRENGTH (PSI) AT AGE (DAYS)

BEAM	7	14	28	90	Other
3					747 (98)
4					864 (97)
5					1029 (44)
9				630	
10				1114	
13					895 (31)
17				1036	
19				740	
20				803	
21				849	
22				639	
23			975		
24			910		
25		1025			
26		1090			
27		1000			
28			707		
29	900				
30	778				
31	799				
32	968				
33	860				
34		670			
35	570				
36	810				
37	700				
38			518		
39		1030			
40		815			
41			793		
42		567			
43	686				
44	820				
45	713				
46		664			
47	687 (8)				
48	928				
49					404 (1 day)
50			851		
53		1023			
57	734				
63			775		
70		730			
122					878 (381 days)
123					585 (379 days)
126					910 (376 days)

APPENDIX G

VARIATIONS IN ESTIMATED QUANTITIES
(EARTH EMBANKMENTS)

APPENDIX C
VARIATIONS IN ESTIMATED QUANTITIES (EARTH EMBANKMENTS)

ITEM NO.	DESCRIPTION	FINAL EST. QUANTITY	FINAL EST. QUANTITY	PERCENTAGE OF EST. QUANTITY	REMARKS
2	8" Stabilized Aggregate Base Course	3,009 SY	3,533 SY	117	Original estimated quantity was low
3	4" Stabilized Aggregate Base Course	5,500 SY	5,289 SY	96	
4	18" Culvert	42 LF	42 LF	100	
5	24" Culvert	62 LF	68 LF	110	
6	Concrete Headwall	2.1 CF	2.1 CF	100	
7	Concrete Ditch Pavement	75 CY	80 CY	107	
9	Excavate Second Stage Cofferdike	101,917 CY	104,120 CY	102	
11b	Dewater System One Maintain and Operate	6 months	23.16 months	368	Dewatering system taken over from concrete dam, at same cost per month; same contractor.
12	Dewater System Two	18 months	0	0	Did not utilize system.
13b	Dewater System Three Maintain and Operate	18 months	8 months	44	Did not need system any longer.
15	Temporary Silt Fences	3,100 LF	2,173 LF	70	Entire quantity not needed for silt control.

APPENDIX C (CONTINUED)

ITEM NO.	DESCRIPTION	FINAL EST. QUANTITY	FINAL QUANTITY	PERCENTAGE OF EST. QUANTITY	REMARKS
16	Silt Basins	8 EA	6 EA	75	Entire quantity not needed for silt control.
17	Exploratory Core Borings	2,300 LF	2,300 LF	100	
18	Portland Cement in Grout	100 CF	60 CF	60	See Note 1.
19	Place Grout	400 CF	96.5 CF	24	See Note 1.
20a	Excavation-Common First 350,000 CY	350,000 CY	350,000 CY	100	
20b	Excavation-Common over 350,000 CY	54,100 CY	195,559 CY	361	Excessive unsatisfactory material in cutoff trench, terminal cone areas; removal of erosion gullies; excavation for oxygen system.
21	Excavation- Impervious Borrow	1,991,618 CY	2,243,922 CY	113	
22	Excavation- Sand Borrow	970,347 CY	936,746 CY	96	
23a	Excavation- Rock, 1st 50,000 CY	50,000 CY	47,522 CY	95	
23b	Excavation- Rock, over 50,000 CY	19,100 CY	0	0	Not needed.
24a	Excavation- Dental, 1st 100 CY	100 CY	100 CY	100	

APPENDIX G (CONTINUED)

ITEM NO.	DESCRIPTION	FINAL EST. QUANTITY	FINAL QUANTITY	PERCENTAGE OF EST. QUANTITY	REMARKS
Contract quantity adequate for grout cap excavation, not provided for required work to properly prepare foundation; 249 CY in 2nd stage dike.					
24b	Excavation- Dental, over 100 CY	100 CY	100	4,461	4,461
25b	Drill Grout Hole	44,450 LF	97,575 LF	219	See Note 2.
25c	Steel Pipe and Fittings	53,304.25 LBS	70,867.08 LBS	133	See Note 2.
25d	Portland Cement in Grout	5,737 CF	13,257 CF	231	See Note 2.
25e	Bentonite in Grout	19,600 LBS	12,754 LBS	65	See Note 2.
25f	Pressure Wash and Test	402.34 HRS	973.14 HRS	242	See Note 2.
25g	Place Grout	17,074 CF	37,145.5 CF	217	See Note 2.
25h	Connect to Grout Hose	1,667 EA	3,224 EA	193	See Note 2.
26a	Foundation Cleanup-Rock Surfaces, 1st 7,500 SY	7,500 SY	7,500 SY	100	
26b	Foundation Cleanup of Rock Surfaces; over 7,500 SY	2,500 SY	24,184.3 SY	967	See Note 3.

APPENDIX C (CONTINUED)

ITEM NO.	DESCRIPTION	FINAL EST. QUANTITY	FINAL QUANTITY	PERCENTAGE OF EST. QUANTITY	REMARKS
27a	Final Foundation Prep. Rock Surf. 1st 12,497 SY	12,497 SY	12,497 SY	100	
27b	Final Foundation Preparation of Rock Surfaces over 12,497 SY	2,000 SY	26,479.5 SY	1,324	See Note 3.
28a	Concrete Treatment 1st 100 CY	100 CY	100 CY	100	
28b	Concrete Treatment over 100 CY	200 CY	2,622.3 CY	1,311	Contract quantity adequate for grout cap; none provided for fillets, dental concrete, etc. used 1199 CY on 2nd stage cofferdike foundation.
29	Cork/Bituminous Expansion Joint	JOB	NONE	0	Not utilized, SAS, SAD, OCE.
30b	Portland Cement in Shotcrete	18,000 CF	21,037 CF	117	See Note 4.
30c	Steel Fibers in Shotcrete	210,000 LBS	421,340 LBS	201	See Note 4.
30d	Place Shotcrete	40,000 CF	67,173 CF	168	See Note 4.
31	Impervious Compacted	1,491.168 CY	1,686.776 CF	113	
32	IWR Compacted	374,700 CY	378,129 CY	101	
33	Sand Compacted	605,550 CY	628,390 CY	104	

APPENDIX C (CONTINUED)

ITEM NO.	DESCRIPTION	FINAL EST. QUANTITY	FINAL QUANTITY	PERCENTAGE OF EST. QUANTITY	REMARKS
34	Sand Filter Compacted	166,447 CY	162,741 CY	98	
35	Coarse Filter Compacted	132,682 CY	123,425 CY	93	
36	Minus 3" Firm Rock Compacted	32,560 CY	26,715 CY	82	
37	3 x 20 Firm Rock Compacted	173,600 CY	169,204 CY	97	
38	3 x 20 Sound Rock Compacted	308,958 CY	310,775 CY	101	
39	Drain Rock	30,100 CY	35,646.8 CY	118	
40	IWR Traffic Compacted	39,000 CY	37,713 CY	97	Associated with Mod. M. Possible error in estimate.
41	-3" Firm Rock Traffic Compacted	24,600 CY	34,554.9 CY	141	
42	IWR-Traffic Compacted 2nd Stage Cofferdike	174,431 CY	176,719 CY	101	
43a	Additional Rolling for Compaction-1st 50 hrs.	50 HRS	50 HRS	100	
43b	Additional Rolling for Compaction, over 50 hrs.	250 HRS	26.5 HRS	10.6	Total Amount
46	Coarse Filter, Stockpiled	7,500 CY	7,500 CY	100	

APPENDIX C (CONTINUED)

ITEM NO.	DESCRIPTION	FINAL EST. QUANTITY	FINAL QUANTITY	PERCENTAGE OF EST. QUANTITY	REMARKS
47	Riprap, Stockpiled	15,000 CY	50,000 CY	337	Includes powerhouse riprap, excess 3 x 20 sound rock. Stockpiles required to be purchased under Mod. I - P004.
50	3" Coarse Aggregate Stockpiled	45,000 CY	45,346.5 CY	101	
51a	Rock Fill Gradation Tests - 1st 12	12 EA	12 EA	100	
51b	Rock Fill Gradation Tests, over 12	6 EA	3 EA	50	Total quantity not needed.
52a	Riprap Gradation Tests - 1st 5	5 EA	5 EA	100	
52b	Riprap Gradation Tests - over 5	3 EA	11 EA	367	Additional tests needed for control.
53	Coarse Filter-Uncompacted	10,700 CY	10,447 CY	98	
54	Sand Filter Uncompacted	6,800 CY	6,345 CY	93	
55	Riprap	39,000 CY	37,340.3 CY	96	
56	Dumped Firm Rock, Unprocessed	17,298 CY	18,405 CY	106	
58	Guardrail	5,125 LF	5,161 LF	101	
59	Anchors	8 EA	8 EA	100	

APPENDIX C (CONTINUED)

ITEM NO.	DESCRIPTION	FINAL EST. QUANTITY	FINAL QUANTITY	PERCENTAGE OF EST. QUANTITY	REMARKS
62a	4" Center Striping	715 LF	0	0	Not required for contract.
62b	4" Edge Striping	7,475 LF	7,062.3 LF	95	
63	Clearing and Grubbing	116 ACRES	135 ACRES	116	Additional clearing required due to impervious borrow expansion.
64	2" Bituminous Surfacing	5,817 SY	5,784 SY	99	
65	Seeding Grasses	108 ACRES	139.7 ACRES	129	Additional acres in borrow area and rock stockpiles.
66	Mulching	108 ACRES	139.7 ACRES	129	Additional acres in borrow area and rock stockpiles.
67	Tree Seedlings	90 ACRES	90 ACRES	100	
68	Concrete Right of Way Markers	20	20	100	
69	Unclassified Excavation for Roads	15,000 CY	29,912 CY	199	Unanticipated excavation to remove erosion gullies at end of transition trenches, i.e., beneath service roads.
70	IWR Fill for Roads	1,000 CY	1,905.4 CY	190	More fill than originally anticipated.
71a	Placing Mortar 1st 50 CY	50 CY	49 CY	98	
71b	Placing Mortar over 50 CY	0	0	0	Not needed.

APPENDIX G (CONTINUED)

ITEM NO.	DESCRIPTION	FINAL EST. QUANTITY	FINAL EST. QUANTITY	PERCENTAGE OF EST. QUANTITY	QUANTITY	REMARKS
72	Unclassified Excavation Fill and Roads	10,500 CY	16,609.5 CY	158		Fill required to refill excavation for erosion of gullies.

NOTE 1: Many of the exploratory borings were grouted under Item No. 25d and 25g which had lower unit price and was more convenient for both Government and Contractor.

NOTE 2: Government estimate entirely too low. Inadequate test data on which to base estimate.

NOTE 3: Quantities entirely too low for work required. Neat-line bottom width would have exceeded estimated quantities, plus slope area; 2/3 of estimated FFP quantity in diversion channel. Cleanup less than FFP quantity; however, cleanup could be performed more than once. Cleanup was 23% over FFP.

NOTE 4: Estimated quantities not sufficient. Estimated quantity probably assumed 3-inch application. No maximum specified in contract. Many areas up to 4-5 inches in thickness to minimum irregularities in rock surfaces.

APPENDIX H

POWERHOUSE "NOSE" GROUTING DATA

APPENDIX H

NOSE No. 041			POWERHOUSE "NOSE" GROUTING DATA									
HOLE No. STATION	ZONE STAGE	DATE DRILLED	DATE GROUTED	ALONG HOLE LENGHT (FT)	5 MINUTE WATER TAKE	TOTAL BAGS	BAGS USED	MIX	CUBIC FEET	NOTES:		
O-V	1	7/28/82	7/30/82	30	.3	15.4	21	5:1 3:1 1:1	.5 21 11.5			
O-V 1.2	1	7/31/82	8/2/82	30	RIGHT		2			JUST PREMIED		
O-W	1	7/28/82	7/30/82	30	.45			5:1	2.5	MULTI SURFACE LEAKS		
O-X	1	7/27/82	7/30/82	30	11.6	2.93	8	5:1 1:1	7.0 2.5	communicated with O-Y & S-L		
O-Y	1	7/27/82	7/30/82	30	7.8	1.33		1:1	2.0			
O-Z	1	7/28/82	7/30/82	30	.5	0		5:1	0			
IA-1	1	7/23/82	7/31/82	30	.03	0	2	5:1	0			
IA-2	1	7/24/82	7/31/82	30	.0	.18	2	5:1	6.5			
IA-2.5	1	7/10/82	7/11/82	30	0	.18	2	5:1	1:0			
IA-3	1	7/23/82	7/31/82	30	18.0	3.27	2	5:1	18.0	communicated with A-4, B-3, & E & C-3		
IA-4	1	7/27/82	8/2/82	30	Comm @ A3	.18	5	5:1	1.0			
IA-5	1	7/29/82	8/2/82	30	Comm @ A3	0		5:1	0			
IA-6	1	7/27/82	8/2/82	30	Comm @ A3	0		5:1	0			
IA-7	1	7/27/82	8/2/82	30	Comm @ A3	.09		5:1	0.5			
IA-8	1	7/29/82	8/2/82	30	Comm @ A3	.36		5:1	2.0	communicated with B-5 & SURFACE LEAKS		
IA-9	1	7/29/82	8/2/82	30	2.5	.09		5:1	0.5			
IB-1	1	7/24/82	7/31/82	30	1.0	.63		5:1	3.5			
IB-1.5	1	8/9/82	8/11/82	30	0	0	1	5:1	0			

APPENDIX H (CONTINUED)

NOSE No. 1&2		POWERHOUSE "NOSE" GROUTING DATA										
HOLE No.	STATION	ZONE	STAGE	DATE DRILLED	DATE GROUTED	ALONG HOLE LENGTH (ft)	5 MINUTE WATER TAKE	TOTAL BAGS	BAGS USED	MIX	CUBIC FEET	NOTES:
1B-2	1			7/23/82	7/31/82	30	Comm. A-3	2.81	2	5:1	15.5	Comm or late with A-3 & A-6
1B-3	1			7/23/82	8/2/82	30	Comm. A-3	.90	4	5:1	5.0	
1B-4	1			7/23/82	8/2/82	30	Comm. A-3	.18		5:1	1.0	Communicate with A-6
1B-5	1			7/23/82	8/2/82	30	Comm. A-3	.09		5:1	0.5	
1B-6	1			7/23/82	8/2/82	30	Comm. C-1	1.09	1	5:1	5.0	
1C-1	1			7/24/82	8/2/82	30	4.0	1.45	2	5:1	3.0	
1C-2	1			7/22/82	8/2/82	30	Comm. C-2	.09		5:1	0.5	
1C-3	1			7/22/82	8/2/82	30	Comm. C-1	.09		5:1	0.5	
1C-4	1			7/23/82	8/2/82	30	Comm. C-1	.09		5:1	0.5	
2A-1	1			8/2/82	8/5/82	30	2.2	.57	4	3:1	2.0	
2A-1.5	1			8/17/82	8/12/82	30	0.2	0	3	3:1	0	
2A-2	1			8/2/82	8/15/82	30	2.0	.4	9	1:1	12.0 3.0	
2A-2.5	1			8/17/82	8/16/82	30	0.3	3.71	3	3:1	2.5 1.5	MULTI. S/L
2A-3	1			8/4/82	8/15/82	30	Comm. C-1	0		3:1	0	
2A-3.5	1			9/15/82	8/19/82	30	2.0	.27	3	5:1	1.5	REACHING M. S/L
2A-4	1			8/14/82	8/15/82	30	2.0	.3	6	3:1 1:1	12.0 2.5	Comm or late A-4 & C-5
2A-4.5	1			8/17/82	8/19/82	30	1.0	.36		5:1	2.0	
2A-5	1			8/14/82	8/15/82	30	0.5	2.66	4	1:1	4.0	Comm or late with A-4 & C-5
2A-5.5	1			8/12/82	8/19/82	30	4.0	1.18		5:1	6.5	
2A-6	1			8/13/82	8/15/82	30	1.3	2.8	2	3:1 1:1	6.5 7.5	MULTI. SURFACE 2.4MS PDRILLED. SEE 2A-5 IN NEXT PAGE

APPENDIX H (CONTINUED)

NOSE No. 2E3			POWERHOUSE "NOSE" GROUTING DATA								
HOLE No. STATION	ZONE STAGE	DATE DRILLED	DATE GROUTED	ALONG HOLE LENGTH (SF)	5 MINUTE WATER TAKE	TOTAL BAGS	BAGS USED	MIX	CUBIC FEET	NOTES:	
2A-6	1	8/9/82		30	.2	.27	1	5:1	1.5		
2A-7	1	8/10/82	8/15/82	30	Comm. E-1	.71		3:1	2.5		
2B-1	1	8/13/82	8/15/82	30	Comm. E-1	.28		3:1	1.0		
2B-2	1	8/13/82	8/15/82	30	Comm. E-1	3.0	3	3:1	0.5		
2B-3	1	8/14/82	8/15/82	30	2.9	0		3:1	0		
2B-4	1	8/14/82	8/15/82	30		.23		3:1	1.0		
2B-5	1	8/15/82	8/15/82	30	4.4	.14		3:1	.5		
2B-6	1	8/15/82	8/15/82	30	3.0	.29		3:1	.0		
2B-7	1	8/15/82	8/15/82	30	Comm. E-1	0		3:1	0		
2C-2	1	8/15/82	8/15/82	30	7.6	0		3:1	0		
2C-3	1	8/15/82	8/15/82	30	5.2	.23		3:1	0		
2C-4	1	8/15/82	8/15/82	30	3.3	.14		3:1	0.5		
3A-1	1	8/31/82	9/7/82	30	2.73	.28		3:1	1.0		
3A-2	1	8/30/82	9/7/82	30	15.2	1.71		3:1	6.0	Common date with 3-2	
3A-3	1	7/2/82	9/7/82	30	Comm. E-2, E-3	2.71	3	3:1	6.0	Joint surface exposure	
3A-4	1	7/2/82	9/7/82	30	Comm. E-2, E-3	.28	3	3:1	1.0		
3A-5	1	7/1/82	9/7/82	30	10.87	2.18	3	3:1	2.0	Common date with 3-2, E-3	
3A-6	1	7/1/82	9/7/82	30	16.0	0		3:1	0		
3B-1	1	8/31/82	9/7/82	30	Comm. E-1	.14	3	3:1	.5		
3B-2	1	8/30/82	9/7/82	30	Comm. E-1	.14		3:1	1.0		

APPENDIX H (CONTINUED)

NOSE No. 3 & 4		POWERHOUSE "NOSE" GROUTING DATA										
HOLE No. STATION	ZONE STAGE	DATE DRILLED	DATE GROUTED	ALONG HOLE	LENGHT (FT)	5 MINUTE WATER TAKE	TOTAL BAGS	BAGS USED	MIX	CUBIC FEET	NOTES:	
3B-3	1	9/21/82	9/8/82	30	12.53	.28	1	3:1	1.0		SURFACE LEAKAGE	
3B-4	1	8/31/82	9/8/82	30	12.53	.57		3:1	2.0			
3B-5	1	9/1/82	9/8/82	30	Comm. A-2	3.75	6	3:1	8.5		MULTI SURFACE LEAKAGE	
3B-6	1	2/30/82	9/8/82	30	MULTI S/L	.26		3:1	1.0			
3C-1	1	3/30/82	9/8/82	30	Comm. A-1	.57		3:1	2.0			
3C-2	1	6/30/82	9/8/82	30	Comm. A-2	.28		3:1	1.0			
3C-3	1	8/31/82	9/8/82	30	13.33	.42		3:1	5.0		SURFACE LEAKAGE	
3C-4	1	3/3/82	9/8/82	30	3.87	0		3:1	0			
4A-1	1	10/9/82	10/21/82	30	22	.42	3	3:1	1.5			
4A-2	1	10/9/82	10/21/82	30	11.6	1.22		3:1	4.5			
4A-3	1	10/11/82	10/21/82	30	6.4	7.25	2	3:1	21.0			
4A-4	1	10/16/82	10/21/82	30	12.1	0.71	9	1:1	24.7		MULTI SURFACE LEAKAGE CAME OUT OF HOLE	
4A-5		10/19/82	—	30	10.5						NOT SHOTED BECAUSE OF SLOW DRILLING PROBLEMS	
4A-6		10/12/82	10/22/82	30	13.33	.14		3:1	0.5			
4A-7		10/11/82	10/22/82	30	13.33	0		3:1	0			
4A-8		10/7/82	10/22/82	30	13.0	.33		1:1	0.5			
4A-9	1	10/9/82	10/22/82	30	6.0	1.66		1:1	2.5			
4A-10	1	10/11/82	10/22/82	30	.01	0		1:1	0			
4S-1	1	10/18/82	10/21/82	30	11.6	.71		3:1	0			
4G-2	1	10/13/82	10/21/82	30	15.2	.25		3:1	3.0		SURFACE LEAKAGE	

APPENDIX H (CONTINUED)

NOSE No. 445			POWERHOUSE "NOSE" GROUTING DATA								
HOLE NO. STATION	ZONE STAGE	DATE DRILLED	DATE GROUTED	PIONG HOLE (CM.)	5 MINUTE WATER TAKE	TOTAL BAGS	BAGS USED	MIX	CUBIC FEET	NOTES:	
4B-3	1	10/13/82	10/21/82	30	15.9	.25		3:1	3.0	SURFACE LEAKS	
4B-4	1	10/16/82	10/22/82	30	10.13	.25	3	3:1	1.0		
4B-5	1	10/16/82	10/22/82	30	13.33	.28		3:1	1.0		
4B-6	1	10/15/82	10/22/82	30	12.8	.4	2	3:1	4.0		
4B-7	1	10/13/82	10/22/82	30	13.05	5.27	18	3:1 1:1 1:1	29.5 11.5 11.5	COMMON GROUT WITH A-3 A-4 & 3-7	
4B-8	1	10/15/82	10/22/82	30	6.1	.33		1:1	2.5		
4C-1	1	10/13/82	10/22/82	30	.01	0		3:1	0		
4C-2	1	10/13/82	10/22/82	30	17.6	3.14	3	3:1	1.0	SURFACE LEAKS	
4C-3	1	10/13/82	10/22/82	30	13.26	.14		3:1	0.5		
4C-4	1	10/16/82	10/22/82	30	14.0	.29		3:1	1.0		
4C-5	1	10/10/82	10/22/82	30	12.8	4.85	5	3:1	17.0	COMMON GROUT WITH A-3 A-4 & 3-7 4.85	
4C-6	1	10/6/82	10/22/82	30	5.4	.27		3:1	1.0		
5A-1	1	11/20/82	12/16/82	30	5.2	7.4	9	3:1	25.0		
5A-2	1	11/27/82	12/16/82	30	10.0	5.46	15	3:1 1:1	2.5	SURFACE LEAKS	
5A-3	1	11/29/82	12/16/82	30	9.73	5.04	17	3:1 1:1	2.5 23.5	SURFACE LEAKS	
5A-4	1	11/30/82	12/17/82	30	comm. A-7	0		3:1	0		
5A-5	1	11/30/82	12/17/82	30	comm. A-7	.25		3:1	1.0		
5A-6	1	12/1/82	12/17/82	30	comm. A-7	0		3:1	0		
5A-7	1	12/1/82	12/17/82	30	14.5 5.5 1.0	1.35	5	1:1	2.0		
5A-8	1	12/10/82	12/17/82	30	comm. A-7	1.66		1:1	2.5		

APPENDIX H (CONTINUED)

NOSE No. 5 ± 6		POWERHOUSE "NOSE" GROUTING DATA										
HOLE No. STATION	ZONE STAGE	DATE DRILLED	DATE GROUTED	ALONG HOLE LENGTH (FT)	5 MINUTE WATER TAKE	TOTAL BAGS	BAGS USED	MIX	CUBIC FEET	NOTES:		
5A-7		12/7/82	12/7/82	30	Comm. with A-7	.66		1:1	1.0			
5A-10		12/7/82	12/17/82	30	Comm. A-7	.33		1:1	2.0	EXCESSIVE SURFACE LEAKS		
5A-11		12/7/82	12/17/82	30	Comm. A-7 A-12	1.33	5	1:1	2.0			
5A-12		12/10/82	12/17/82	30	Comm. A-7 A-11	0		1:1	0			
5B-1		11/30/82	12/16/82	30	12.0	1.0	3	3:1	3.5			
5B-2		11/30/82	12/16/82	30	11.46	4.0		1:1	5.0			
5B-3		11/30/82	—	30	12.0					Fluorescent ~ 14 grout ~ 10m = 16.82		
5B-4		12/6/82	—	30	10.66					Fluorescent from 2/1/82		
5B-5		12/10/82	12/17/82	30	Comm. A-7	5.80	8	3:1	12.0	Comm. with ~ 1h A-7, 3-2, 3-3, 3-2		
5B-6		12/6/82	12/17/82	30	Comm. A-7	2.33		1:1	3.5			
5B-7		12/14/82	12/17/82	30	7.33	.33		1:1	0.5			
5C-1		12/11/82	12/15/82	30	10.66	5.18	11	3:1	7.5			
5C-2		12/2/82	12/17/82	30	12.4	—	3	3:1	0			
5C-3		11/30/82	12/1/82	30	11.53							
5C-4		12/6/82	12/17/82	30	Comm. A-7	0				Fluorescent from 12/6/82		
5C-5	1	12/10/82	12/17/82	30	Comm. A-7	0		1:1	0			
5C-6	1	12/7/82	12/17/82	30	Comm. A-7	.33		1:1	0.5			
5A-1	1	12/7/82	2/21/83	30	6.0	3.72	5	5:1	20.5			
5A-2	1	12/23/82	2/21/83	30	8.2	36.71	37	5:1 3:1 1:1	71 43 28.5			
5A-3	1	12/23/82	2/21/83	30	6.2					Grouted up already		

APPENDIX H (CONTINUED)

NOSE No. 6			POWERHOUSE "NOSE" GROUTING DATA									
HOLE No. STATION	ZONE STAGE	DATE DRILLED	DATE GROUTED	ALONG HOLE FEET	5 MINUTE WATER TAKE	TOTAL BAGS	BAGS USED	MIX	CUBIC FEET	NOTES		
6A-4	1	12/30/82	2/21/83	30	5.8	8.33	10	5:1	12.5	MULTI SURFACE LEAKS		
6A-5	1	2/2/83	2/23/83	30	.01	0	3	3:1	0			
6A-6	1	2/10/83	2/23/83	30	.01	0		3:1	0			
6A-7	1	2/11/83	2/23/83	30	.12	0		3:1	0			
6A-8	1	2/11/83	2/23/83	30	.44	.5		3:1	2.0			
6A-9	1	2/2/83	2/23/83	30	5.86	1.25		3:1	6.5	COULD NOT GROUT BETWEEN 2-7 & 2-8 leaks		
6A-10	1	2/2/83	2/23/83	30	2.0	.25	1	3:1	3.0			
6B-1	1	2/11/83	2/21/83	30	7.8	3.33	5	1:1	5.0	communicated with 6-1		
6B-2	1	12/30/82	2/21/83	30	7.3	7.0	5	1:1	12.5	communicated with 2-3, 2-6 & 2-8		
6B-3	1	1/11/83	2/21/83	30	8.1					grouted up already		
6B-4	1	2/1/83	2/21/83	30						grouted up already		
6B-5	1	2/3/83	2/21/83	30						grouted up already		
6B-6	1	2/4/83	2/23/83	30	.12	0		3:1	0			
6B-7	1	2/4/83	2/23/83	30	4.03	1.25	3	3:1	6.5	communicated with 6-9		
6B-8	1	2/5/83	2/23/83	30	comm 6-9	.42		3:1	1.5	communicated with 6-9		
6C-1	1	12/30/82	2/21/83	30	3.0	32.0	14	3:1 1:1	28.5 4.5	MULT SURFACE LEAKS		
6C-2	1	12/30/82	2/21/83	30	6.0	5.66	7	1:1	8.5	communicated with 3-1, 3-4		
6C-3	1	1/1/83	2/21/83	30	12.4					grouted up already		
6C-4	1	2/1/83	2/21/83	30	-					grouted up already		
6C-5	1	2/1/83	2/21/83	30	-					grouted up already		

APPENDIX H (CONTINUED)

APPENDIX I
SUMMARIES OF NEGOTIATIONS

APPENDIX I

SUMMARIES OF NEGOTIATIONS

Modifications to Embankment Contract

P001 - Exploratory Core Borings Over 2300 LF - Mod A

The contract initially had an estimated quantity of 2300 linear feet of exploratory borings. Due to field conditions encountered, additional borings were desired. This modification provided for 3,100 linear feet of core borings, of which 2,329.2 LF were used.

Cost - \$91,723.90

P004 - Coarse Aggregate from Concrete Quarry - Mod I

This modification permitted the substitution of 3-inch concrete aggregate from the concrete dam quarry in lieu of its being obtained from embankment stockpiles of sound rock. Also, the Government's option not to process all sound rock in stockpile was deleted, i.e., all stockpiled rock was required to be processed.

Cost - \$00.00

P005 - Partial Payment for Stockpiled Materials - Mod J

Interim payment for stockpiled coarse filter and 3x20 sound and firm rock 60% of unit price. Payment recovered as material was used.

Cost - \$00.00

P007 - Remove Rocks and Trees - Mod Q

Directed removal of dead trees and loose rocks from river bank slope, upstream of dam on SC side, directed by SADEN-F. Install anchor block for buoy line system.

Cost - \$514.00

P018 - Second Stage Dike VE - Mod D

Change in design for portion of 2nd stage cofferdike near tie-in with downstream cofferdike. Entire foundation was not excavated and treated, only toe trenches and cutoff trench under centerline.

Savings - \$9,763.40

P010 - Boyles Mobilization Disruption - Mod S

Payment for subcontractor's mobilization disruption caused by Government changes in decision on acceptability of foundation and its release for drilling and grouting.

Cost - \$3,690.00

APPENDIX I (CONTINUED)

P012 - Giant Fillet - Mod L

Placement of large, formed concrete fillet against the upstream slope of the South Carolina cutoff trench, after drilling and blasting.
Cost - \$36,372.00

P013 - Change Impervious Fill Slope - SC - Mod P

Steepened the interior slopes of the impervious, sand, and coarse filter in the South Carolina upstream notch, adjacent to concrete dam to better fit existing topography.
Cost - \$42,865.90

P014 - Add Grout Curtain Lines - Mod E

Provided 2 additional grout lines in highly weathered area of GA West, Station 11+80 to Station 13+00. Provide perimeter grout line from Station 5+85 to 6+50.
Cost \$131,550.000

P015 - Stockpile IWR - Mod U

Excavated IWR from upstream cofferdike and stockpiled it in the impervious borrow area for use in powerhouse switchyard. Lower upstream dike to elevation 350.
Cost - \$49,990.50

P016 - Impervious Borrow Test Trenches - Mod X

Excavated test trenches in impervious borrow area as directed by Government to investigate materials to be used following construction season.

Cost - \$8,900.00

P017 - Localized Foundation Treatment - Mod H

Specialized treatment for "Bathtub" area of GA West foundation, Station 5+50 to 6+60, approximately.
Cost - \$160,000.000

P018 - Additional Riprap in South Carolina - Mod V

Provided additional riprap protection for reference line area upstream to protect thin section of 3x20 rockfill. Also riprap in this area somewhat light compared to specifications.
Cost - \$25,000.000

P019 - Repair Closure Dike - Mod W

Minor repair to upstream closure dike, IWR section at east side of diversion channel, approximate elevation 370, during construction.
Cost - \$00.00

APPENDIX I (CONTINUED)

P021 - Change to Upstream Closure Dike - Mod M

Increased top elevation of upstream closure dike from 430.0 to 440.0, some rezoning.
Cost - \$647,800.00

P022 - Change Cofferdike Excavations - Mod K

Changed downstream cofferdike to remove entire section to elevation 305 rather than 320. Breach in upstream cofferdike not to be refilled. Upstream cofferdike available as source of IWR.
Cost - \$210,000.00

P023 - Alternate Access - Mod BB

Provided alternate access to diversion channel foundation upstream of cutoff trench so that preparation work could continue while access through cutoff trench was blocked by additional drilling and grouting.
Cost - \$9,250.00

P024 - Added Exploratory Borings - Mod CC

Perform 3-NX exploratory borings in diversion channel cutoff trench. Requested by EN-GC after subcontractor had demobilized.
Cost - \$11,500.00

P027 - Closure Dike Repair - Mod AA

Excavate and repair seepage area on the upstream slope of the upstream cofferdike, under Government direction.
Cost - \$110,000.00

P028 - Furnish and Place GA #89 Stone - Mod EE

Substitution of GA #89 stone for coarse filter in inclined drains. Government furnished stockpiled did not yield required quantities.
Cost - \$421,197.65

P032 - Impervious Borrow Test Pits - Mod GG

Excavate and refill impervious borrow test pits, using Cat 245 backhoe as directed by Government.
Cost - \$1,040.00

P033 - Change Roller Feet - Mod LL

Replace existing sheepfoot roller feet with Southwest RR-05 type, to improve compaction characteristics.
Cost - \$7,208.00

APPENDIX I (CONTINUED)

P034 - Fines in Sound Rock Stockpile - Mod MM

Payment for settlement of claim for excessive amount of fines (minus #30 sieve) in the sound rock stockpiles.

Cost - \$411,410.00

P035 - Deletion of Coarse Filter Blanket - Mod HH

Deleted downstream coarse filter blanket above elevation 395 between Stations 17+00 and 20+00. Substituted with mass sand.

Savings - \$20,905.00

P036 - Embankment Foundations Delay - Mod RR

Payment of claim for embankment foundation delays during first stage diversion.

Cost - \$4,732,257.00

P037 - Delays to 2nd Stage Diversion - Mod SS

Payment of claim for delays in performing second stage diversion.

Cost - \$220,000.00

P038 - Post Diversion Foundation Delays - Mod TT

Payment of claim for foundation delays during second stage diversion, primarily in the diversion channel.

Cost - \$500,000.00

P039 - Change Impervious Fill Moisture Specs. - Mod II

Changed upper limit of moisture range for impervious-wet material from 3.0 to 5.5 percentage points above optimum.

Cost - \$00.00

P040 - Slope Protection for Upstream Mass Sand - Mod JJ

Provided slope protection for upstream mass sand slope between elevations 439 and 450, protection above closure dike top (440) during pool filling.

Cost - \$43,500.00

P041 - VE - Delete 8" Base Course - Mod NN

Accepted VE proposal to delete 8" base course on GA embankment. Substitute by raising minus 3-inch firm rock (top zone) the 8" to form base for pavement.

Savings - \$12,293.00

P043 - Deface Upstream Closure Dike - Mod QQ

Excavate 3 notches in face of upstream closure dike, through IWR and minus 3" firm rock, exposing rock fill. This will minimize erosion potential of embankment upstream sand zone during reservoir filling.

Cost - \$2,500.00

APPENDIX I (CONTINUED)

P044 - Additional Riprap, GA Embankment - Mod KK

Increase riprap thickness from 2 feet to 3 feet measured normal to embankment slope.

Cost - \$71,000.00

P045 - Riprap Paved Ditches - Mod UU

Provide riprap paved ditches, one along downstream GA embankment toe and one along the entire downstream SC embankment toe.

Cost - \$31,200.00

APPENDIX J

EARTH EMBANKMENTS

BORING LOGS
Grouting Efficiency Analysis

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE

432.5

Hole No. RE-12

PROJECT

RICHARD B. RUSSELL DAM

INSTALLATION

CALHOUN FALLS, S.C.

SHEET 2

1 OF 5 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV. ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			METADACITE LIGHT GRAY, FINE GRAINED SLIGHTLY PORPHYRITIC, PITTED WITH IRON STAINING VARIANTS FE-MG MICAS		Box 1	PULL 2 (CONTINUED)
30				100		PULL 3 FROM 29.8 REC 0.5 TO 30.3 CL 0.0 RUN 0.5
31				30.3		
32			31.9' SUBHORIZONTAL FRACTURE, SMALL AMOUNT OF GROUT	100 RQD 100		PULL 4 FROM 30.3 TO 35.4 RUN 5.1 REC 5.1 CL 0.0
33						
34						
396.8			35.4 - 35.7 ACCUMULATED LOST CORE (0.3') 35.7'-			
36			(CORE DIVIDED BETWEEN META-DACITE AND META-DIAPASE) WITH NUMEROUS HEALED HIGH ANGLE FRACTURES	82 RQD 0 37.1		PULL 5 FROM 35.4 REC 1.4 TO 37.1 CL 0.3 RUN 1.7
38			37.1 - 39.0 ACCUMULATED LOST CORE 1.9	53 RQD 0		PULL 6 FROM 37.1 REC 2.1 TO 41.1 CL 1.9 RUN 4.0
40			CONTINUED ON SHEET 3			

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE
432.5

Hole No. RE-12

PROJECT

RICHARD B. RUSSELL DAM

INSTALLATION

CATHOLAN FAULS, S.C.

SHEET 3

OR 5 SHEETS

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV. ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
40 ^b	40 ^b	+	METADIABASE WITH SEVERAL HIGH ANGLE FRACTURES, GREEN - VERY FINE GRAINED - DIKE MATERIAL	40.1	Box 1	PULL 6 (CONTINUED)
42	42	+		41.1		
44	44	+		100 RQD 50		PULL 7 FROM 41.1 TO 45.9 RUN 4.8 REC 4.8 CL 0.0
46	46	+	45.9 - 47.9 BREAK WITH TWO HIGH ANGLE FRACTURES - OPEN IRON STAINED FACES	45.9	Box 2	PULL 8 FROM 45.9 TO 50.0 RUN 4.1 REC 4.1 CL C.C
48	48	+		100 RQD 65		
382.5	50	+	50.0 PORPHYRITIC META-DACITE AND METADIABASE 50.9'-51.2' HEALED HIGH ANGLE FRACTURE	50.0		PULL 9 FROM 50.0 TO 53.1 RUN 3.1 REC 3.1 CL 0.0
381.1	51	+	51.1 PORPHYRITIC META-DACITE TO GRANO- DIORITE	100 RQD 53		
379.7	52	+	52.8 METADACITE	53.1		PULL 10 FROM 53.1 TO 57.0 RUN 3.9 REC 3.9 CL 0.0
54	54	+		100 RQD 95		
56	56	+				
375.5	58	+	57.0 METADIABASE CUT BY AN ACCORDANT OPEN FRACTURE WITH IRON STAIN ON FACES CONTINUED ON SHEET 4 -			PULL 11

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE
432.5

Hole No. RE-12

PROJECT
RICHARD B. RUSSELL DAMINSTALLATION
CALHOUN FALLS, S.C.SHEET 4
OF 5 SHEETS

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV. ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
a	b	c	d	e	f	g
	58 ^b		PORPHYRITIC METADACITE LIGHT GREEN - FINE GRAINED PORPHYRITIC 58.2 - 58.6 HEALED HIGH ANGLE FRACTURES (TWO)	100 RQD 78	Box 2 60.0 Box 3	PULL 11 (CONTINUED) FROM 57.0 TO 61.8 RUN 4.8 REC 4.8 CL 0.0
	60					
	61.8		61.8 - 62.5 OPEN HIGH ANGLE FRACTURES FACES CONTAIN MINOR AMOUNTS OF MUSCOVITE, PYRITE OR OTHER IRON SULFIDE MIN- ERALS	100 RQD 53		PULL 12 FROM 61.8 REC 4.7 TO 66.5 CL 0.0 RUN 4.7
	62					
	64					
	66					
	68					
	68.5		68.5 - 69.2 HEALED HIGH ANGLE FRACTURE	100 RQD 28	66.5	PULL 13 FROM 66.5 TO 70.9 RUN 4.4 REC 4.4 CL 0.0
	70		69.0 - 70.8 OPEN HIGH ANGLE FRACTURE			
	70.9		70.9 - 72.2 BREAK EVERY 0.1' - 0.2' (PROBABLY BY DRILL ACTIVITY)		70.9	PULL 14 FROM 70.9 TO 76.9 RUN 6.0 REC 6.0 CL 0.0
	72					
	74					
	76		75.9' GROUT ON BREAK NOR- MAL TO HOLE AXIS CONTINUED ON SHEET 5		75.9	

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE
432.5

Hole No. RE-12

SHEET 5
015 SHEETSPROJECT
RICHARD B. RUSSELL DAMINSTALLATION
CALHAN FALLS, S.C.

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV. ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	76.6		PORPHYRITIC META-DACITE		Box 4	PULL 14 (CONTINUED)
	76.3 - 76.6		OPEN HIGH ANGLE FRACTURE			
78			77.8 - 78.4 OPEN HIGH ANGLE FRACTURE	100		PULL 15
				RQD		FROM TO
				82		RUN 4.7 REC 4.7 CL 0.0
80			80.3 - 80.9 BREAK PROBABLY HIGH ANGLE FRACTURE WITH FURTHER BREAKAGE BY DRILL ACTIVITY			
82			82.3 - 82.4 BREAK NORMAL TO HOLE AXIS	100		PULL 16
				RQD		FROM 81.5' TO 84.9'
				97		RUN 3.4' REC 3.4' CL 0.0'
84			BOTTOM OF BORING 84.9			

DRILLING LOG		DIVISION SOUTH ATLANTIC	INSTALLATION ELBERTON, GA.	SHEET 1 OF 3 SHEETS		
1. PROJECT RICHARD B. RUSSELL		10. SIZE AND TYPE OF BIT NWX				
2. LOCATION (Coordinates or Station)		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL				
3. DRILLING AGENCY SAVANNAH DISTRICT		12. MANUFACTURER'S DESIGNATION OF DRILL SIMCO ROTARY				
4. HOLE NO. (As shown on drawing title and file number)		13. TOTAL NO. OF OVER- BURDEN SAMPLES TAKEN		DISTURBED	UNDISTURBED	
5. NAME OF DRILLER Brett Campbell (Boyles Bros.)		14. TOTAL NUMBER CORE BOXES 2				
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG. FROM VERT.		15. ELEVATION GROUND WATER				
7. THICKNESS OF OVERTURDEN 0		16. DATE HOLE STARTED COMPLETED 19 JUN 1980 20 JUNE 80				
8. DEPTH DRILLED INTO ROCK 25.7		17. ELEVATION TOP OF HOLE 36E.9				
9. TOTAL DEPTH OF HOLE 25.7		18. TOTAL CORE RECOVERY FOR BORING 91 %				
		19. INSPECTOR T.A. Pope				
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV- ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
36.89	0	b c	QUARTZ FELDSPAR GNEISS WITH 5% CHLORITE, SOME PINK FELDSPAR. LIGHT GRAY BROWN, SEVERELY TO BADLY WEATHERED AND STAINED GRAVEL SIZED FRAGMENTS.	41	Box 1	PULL 1 FROM C.C. TO 3.4' RUN 3.4' REC 1.4' CL 2.0'
	1					
	2			RGD		
	3		GFG AS ABOVE, WITH LARGE SEGMENTS	C		
	3.25 - 3.6		3.25 - 3.6 JOINT WEATH/STAINED			
	3.35 - 3.45		" " "			
	3.7 - 3.85		3.7 - 3.85 2 INTERSECTING JOINTS			
	3.8 - 4.45		3.8 - 4.45 ZONE OF BADLY WEATHERED AND BROKEN GRAVEL SIZED FRAGMENTS			
	5		WEATHERED AND STAINED JOINTS AT 4.45 - 4.65, 4.95 - 5.0, 5.0 - 5.25,	100		
	5.3 - 5.8		5.3 - 5.8	RGD		
	5.35 - 5.85		5.35 - 5.85 TWO INTERSECTING STAINED JOINTS	58		
	6.3 - 7.9		6.3 - 7.9 CORE BROKEN INTO GRAVEL AND SMALL COBBLE- SIZED PIECES BY NUMEROUS HIGH AND LOW ANGLE JOINTS			
	7					
	7.9' - 11.9'		7.9' - 11.9' CORE BROKEN INTO GRAVEL SIZED FRAGMENTS - POOR RECOVERY			
	8					
359.9	9		CONTINUED ON SHEET 2			

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE

368.9

Hole No. RE-14

PROJECT

RICHARD B. RUSSELL

INSTALLATION

ELBERTON, GA.

SHEET 2

of 3 SHEETS

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV. ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
		c	d	e	f	g
359.9	9.0		QUARTZ FELDSPAR GNEISS (AS DESCRIBED)		Box 1	PULL 3 (CONTINUED) FROM 7.9' TO 11.9' RUN 4.0' REC 1.6' CL 2.4'
	10			40	RQD 0	
	11					
	12		11.9'-12.3' CORE BROKEN INTO GRAVEL SIZED PIECES BY SEVERAL INTERSECTING, WEATH- ERED JOINTS.			PULL 4 FROM 11.9 TO 16.4 RUN 4.5 REC 4.5 CL 0.0
	13		NEAR HORIZONTAL JOINTS, ALL WEATHERED AND STAINED AT: 12.3, 12.75, 12.95, 13.0 WEATH. AND STAINED JOINTS AT: 13.35 - 13.45, 13.35 - 13.55		100	
	14		13.55 - 13.9 BROKEN INTO GRAVEL SIZED PIECES.		RQD 73	
	15		14.0' MODERATELY WEATHERED WITH PARTIALLY HEALED SOLUTION JOINTS			
	16		14.2'-14.4' STAINED JOINT WITH PINK ZEOLITE JOINT WITH EPIDOTE, OPEN AND STAINED 14.65 - 15.3 HEALED 15.3 - 15.7			
	17		15.7 LOW ANGLE STAINED JT. 16.2'-16.5' IRREGULAR BREAK LINED WITH ZEOLITE 16.4'-16.75 SEVERAL JOINTS WITH FINE SAND			
351.9			CONTINUED ON SHEET 2!			

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE

368.9

Hole No. RE-14

SHEET 3

OF 3 SHEETS

PROJECT

RICHARD B. RUSSELL

INSTALLATION

ELBERTON, GA.

ELEVATION

DEPTH

LEGEND

CLASSIFICATION OF MATERIALS
(Description)

d

% CORE
RECOV.
EBOX OR
SAMPLE
NO.
FREMARKS
(Drilling time, water loss, depth of
weathering, etc., if significant)

g

368.9

17.0

c

QUARTZ FELDSPAR GNEISS
AS DESCRIBED

17.5'

18

16.95 - 17.05 JOINTS WITH

FINE SAND

PULL 5

FROM 16.4'

TO 21.0'

RUN 4.6

REC 4.6

CL 0.0

19

17.2 MECHANICAL BREAK ALONG

HEALED CHLORITIC JOINT

Box
2

18.95 - 19.25 JOINT WITH

EPIDOTE AND MANGANESE OX.

100
RQD
88

20

19.2 MECHANICAL BREAK

19.75 - 19.9 MUD AND MN OXIDE

IN IRREGULAR BREAK

21

20.3 - 20.8 2 VUGGY JOINTS

WITH MANGANESE OXIDE

20.9 - 21.0 SEVERAL JOINTS

FRAGMENTED ROCK

22

21.1' - 21.3' INTERSECTING

JOINTS WITH ZEOLITE

21.85 MECHANICAL BREAK

100
RQD
89

23

23.15 OPEN JOINT

24

24.15 - 24.4 ZONE OF BROKEN

AND STAINED ROCK

25

24.7 LOW ANGLE JOINT. STAINED

25.25 - 25.35 STAINED JOINT

343.2

BOTTOM OF BORING 25.7'

DRILLING LOG			DIVISION SOUTH ATLANTIC	INSTALLATION CALHOUN FALLS, S.C.	SHEET OF 4 SHEETS
1. PROJECT RICHARD B. RUSSELL PROJECT			10. SIZE AND TYPE OF BIT		
2. LOCATION (Coordinates or Station) 9+23			11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL		
3. DRILLING AGENCY SAVANNAH DISTRICT			12. MANUFACTURER'S DESIGNATION OF DRILL		
4. HOLE NO. (As shown on drawing title and file number) RE-22			13. TOTAL NO. OF OVER- BURDEN SAMPLES TAKEN DISTURBED UNDISTURBED		
5. NAME OF DRILLER BOYLES BROS. DRILLER			14. TOTAL NUMBER CORE BOXES 7		
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input checked="" type="checkbox"/> INCLINED 20° DEG. FROM VERT.			15. ELEVATION GROUND WATER		
7. THICKNESS OF OVERTBURDEN 0.0			16. DATE HOLE STARTED COMPLETED		
8. DEPTH DRILLED INTO ROCK 97.9			17. ELEVATION TOP OF HOLE 392.0		
9. TOTAL DEPTH OF HOLE 97.9			18. TOTAL CORE RECOVERY FOR BORING NA		
			19. INSPECTOR CHARLES H. COMBS		
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV- ERY	BOX OR SAMPLE NO.
392.0	0	b	d	94	1
	1		0.0 - 0.65 BROKEN PROBABLY BY DRILL ACTION		Box
	2		0.65 - 1.3 OPEN HIGH ANGLE FRACTURE, MOD. SMOOTH, SMALL AMOUNT OF GROUT ON FACES. POSSIBLY OPENED BY DRILL ACTION	RQD	
	3		2.0 - 2.3' HEALED HIGH ANG. 2.6' - META-DIABASE	48	
	4		DIKE, MODERATELY HARD APHANITIC, HOMOGENOUS, DARK GRAY-GREEN		
	5		4.7' - 5.0' ACCUMULATED LOST CORE (0.3)	5.0	
	6				
	7			98	
	8			RQD	
	9			68	
	10		8.0 - 8.5 OPEN HIGH ANGLE FRACTURE, TITANIUM STAINED SMOOTH		
	11		9.15 BREAK (<0.05)		
	12			10.0	
	13		10.0' ACCUMULATED LOST CORE (0.1)		
				100	
				RQD	
				43	
				J-10	
CONTINUED ON SHEET 2 -					

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE

392.0

Hole No. RE-22

PROJECT

RICHARD B. RUSSELL PROJECT

INSTALLATION

CATHOLIN FALLS, S.C.

SHEET 2

OF 4 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV. E	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	13.6	+	META DIABASE (AS DESCRIBED)		Box 1	
14	+	+	13.4' - 13.75' OPEN HIGH ANGLE FRACTURE, MOD. SMOOTH	14.05		PULL 4 FROM 14.05 TO 17.95 RUN 3.9 REC 3.9 CL C.C
15	+	+	TITANIUM STAINED	14.6		
16			PORPHYRITIC META-DACITE MASSIVE, NUMEROUS PHENO- CRYSTS, QUARTZ AND FELD- SPAR, PORPHYRITIC, LIGHT GRAY, FRESH, HARD, IRON- MAGNESIUM MICAS, FINE GRAINED	RQD	16.0	
17					Box 2	
18				17.95		PULL 5 FROM 17.95 TO 18.70 RUN C.75 REC C.75 CL C.C
19				RGD	18.70	
20						
21				RGD	76	PULL 6 FROM 18.70 TO 23.15 RUN 4.45 REC CL
22						
23				23.15		
24				23.70		
25						PULL 7 FROM 23.15 TO 23.70 RUN 0.55 REC CL
26				RQD	79	
27					27.08	PULL 8 FROM 23.7 REC TO 27.8 CL RUN 4.1
28				RGD	100	
29					29.05	PULL 9 FROM 27.1 REC TO 29.1 CL RUN 2.0
30			CONTINUED ON SHEET 3			PULL 10

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE

392.0

Hole No. RF-22

PROJECT

RICHARD B. RUSSELL PROJECT

INSTALLATION

CALHOUN FALLS, S.C.

SHEET 3

OF 4 SHEETS

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV. ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
a	b	c	d	e	f	3
	30 ^b		PORPHYRITIC METADACITE (AS DESCRIBED)		30.8	PULL 10 FROM 29.1 REC 4.9 TO 34.0 CL 0.0 RUN 4.9
	32			RQD 84	Box 3	
	34			33.95 100 34.9		NOTE: SCALE CHANGE @ 30.0
	36			RQD 65		PULL 11 FROM 33.95 REC 0.95 TO 34.9 CL 0.0 RUN 0.95
	38			63 36.5 100 RQD 70 38.7		PULL 12 FROM 34.9 REC 1.6 TO 36.5 CL 0.0 RUN 1.6
	40					
	42					
	44					
	46					
	48					
	50					
	52		52.8 - 53.1 OPEN HIGH ANGLE FRACTURE, MOD. SMOOTH	52.8		
	54					
	56	++	METADIABASE	55.0	RQD 66	PULL 18 FROM 52.8 REC 4.7 TO 57.5 CL 0.0 RUN 4.7
	58	++	57.0 - 57.2 OPEN HIGH ANGLE FRACTURE (COMPOUND) MOD. SMOOTH, MODERATELY TITANIUM STAINED	57.2		
	60	++	60.65 - 60.9 OPEN HIGH ANGLE FRACTURE SMOOTH, PARTIALLY ILLED	60.9	RQD 80	PULL 19 FROM 57.5 TO 62.4 RUN 4.9 REC 4.9 CL 0.0
	62	++	61.6 - 61.85 " 62.1 - 62.15 "	62.35	Box 5	
	64	++	63.0 - 66.8 NUMEROUS HEALED HIGH ANGLE FRACTURES			PULL 20
			CONTINUED ON SHEET 4			

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE

392.0

Hole No. RE-22

SHEET 4

OF 4 SHEETS

PROJECT

RICHARD B. RUSSELL PROJECT

INSTALLATION

CALTOWN FALLS, SC.

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV. ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	64b	+	METADIABASE			
66		+	CORE CAN BE BROKEN BY HAND ALONG HEALED FACES 62.0 - 67.0	100 RQD 0	Box 5	PULL 20 (CONT'D) FROM 62.35 REC 4.9 TO 67.25 CL 0.0 RUN 4.9
68		+	METADIABASE (PORPHYRITIC)			PULL 21 FROM 67.25 TO 77.00 RUN 9.75 REC 9.75 CL 0.00
70		+		100		
72		+		RQD 96		
74		+				
76		+			79.8	
78		+	METADIABASE	100 RQD 100, 79.0	Box 6	PULL 22 FROM 77.0 REC 2.0 TO 79.0 CL 0.0 RUN 2.0
80		+		100		
82		+		RQD 58		
84		-	PORPHYRITIC METADIABASE	83.4 83.9		PULL 23 FROM 79.0 TO 83.9 RUN 4.9 REC 4.9 CL 0.0
86		+		100		
88		+		RQD 60		
90		+		88.9		
92		+	METADIABASE	90.7	90.9	PULL 24 FROM 83.9 TO 88.9 RUN 5.0 REC 5.0 CL 0.0
94		+			Box 7	
96		+			93.8	PULL 25 FROM 88.9 REC 4.9 TO 93.8 CL 0.0 RUN 4.9
		++	BOTTOM OF BORING 97.9	100		

DRILLING LOG		DIVISION <u>SOUTH ATLANTIC</u>		INSTALLATION <u>CALHOUN FALLS, S.C.</u>		SHEET 1 OF 5 SHEETS	
1. PROJECT		RICHARD B. RUSSELL DAM		10. SIZE AND TYPE OF BIT		11. DATUM FOR ELEVATION SHOWN (TBM or MSL)	
2. LOCATION (Coordinates or Station)		9+44		MSL		12. MANUFACTURER'S DESIGNATION OF DRILL	
3. DRILLING AGENCY		SAVANNAH DISTRICT		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED	UNDISTURBED
4. HOLE NO. (As shown on drawing title and file number)		RE-23		14. TOTAL NUMBER CORE BOXES 7		15. ELEVATION GROUND WATER	
5. NAME OF DRILLER		Boyle Bros.		16. DATE HOLE		STARTED	COMPLETED
6. DIRECTION OF HOLE		<input type="checkbox"/> VERTICAL <input checked="" type="checkbox"/> INCLINED <u>20°</u> DEG. FROM VERT.		17. ELEVATION TOP OF HOLE		392.4	
7. THICKNESS OF OVERTBURDEN		0.0		18. TOTAL CORE RECOVERY FOR BORING		84	
8. DEPTH DRILLED INTO ROCK		96.5		19. INSPECTOR		CHARLES H. COMBS	
9. TOTAL DEPTH OF HOLE		96.5					
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV- ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)	
a	b	c	d	e	f	g	
			METADIABASE DIKE MATERIAL, MODERATELY HARD TO HARD, APHANITIC, DARK, HOMOGENOUS, DARK GRAY-GREEN 0.8 - 1.1 HIGH ANGLE FRACTURE, SMOOTH, MODERATELY FRESH.		Box 1	PULL 1 FROM 0.0 TO 4.9 RUN 4-9	
2			1.4 - 1.5 HIGH ANGLE FRACTURE OPEN, MOD. SMOOTH, MOD. WEATHERED, BROKEN CLAY COATING ON FACES	RGD 67.3			
3			METADACITE MASSIVE, DARK, HOMOGENOUS METAMORPHOSED IGNEOUS ROCK MODERATELY HARD TO HARD, FINE-GRAINED, LIGHT GRAY, FRESH, SLIGHTLY PORPHYRITIC, TO PORPHYRITIC	2.9			
4			4.15 - 4.3 BROKEN PROBABLY BY DRILL ACTION	RGD 67.3			
5			4.85 - 5.13 - 5.3 SUB-HORIZONTAL FRACTURES	4.9		PULL 2 FROM 4.9 TO 8.3 RUN 3.4	
6			5.3 - 5.5 HIGH ANGLE FRACTURE, MOD. TITANIUM STAINED, SMOOTH	RGD 70.6			
CONTINUED ON SHEET 2!							

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE

392.4

Hole No. RE-23

PROJECT

RICHARD B. RUSSELL DAM

INSTALLATION

CAHAWA FALLS, S.C.

SHEET 2
OF 5 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV. ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			META-DACITE (AS DESCRIBED)		Box 1	PULL 2 (CONTINUED) Note: SCALE CHANGE @ 6.0
8				8.3		
10				RQD 96		PULL 3 FROM 8.3 TO 10.8 RUN 2.5
12				10.8		
14				RQD 71.4		PULL 4 FROM 10.8 TO 15.7 RUN 4.9
16			14.55 - 14.7 HIGH ANGLE FRACTURE, MOD. STAINING, BROKEN BY DRILL ACTIVITY	15.7	Box 2	PULL 5 FROM 15.7 TO 20.5 RUN 4.8
18				RQD 95.8		
20			19.0 - 19.15 HIGH ANGLE FRACTURE, TITANIUM STAINED, SMOOTH, IRON OXIDE COATING			PULL 6 FROM 20.5 TO 25.3 RUN 4.8
22			21.25 - 21.45 SUBHORIZONTAL FRACTURES, MOD. SMOOTH SOME ARE OPEN	RQD 85.4		
23			CONTINUED ON SHEET 3			

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE
392.4

Hole No. RE-23

PROJECT

RICHARD B. RUSSELL DAM

INSTALLATION

CAULTON FRIES S.C.

SHEET 3

of 5 SHEETS

ELEVATION a	DEPTH 23b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV. E	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
			META DACITE (AS DESCRIBED)		Box 2	PULL 6 (CONTINUED)
25			23.0 - 23.25 HIGH ANGLE FRACTURE MOD. SMOOTH	25.3		PULL 7 FROM 25.3 To 30.2 RUN 4.9
27					RQD 94.9	
29				30.2	30.2	
31					Box 3	PULL 8 FROM 30.2 To 33.0 RUN 2.8
33					RQD 100	
35					33.0	PULL 9 FROM 33.0 To 37.7 RUN 4.7
37			37.7 - 38.25 HIGHLY FRACTURED - PROBABLY THROUGH DRILL ACTION	37.7		
39			38.75 - 39.45 META DACITE CUT BY APPROX. VENT META DIABASE DIKE ~ 0.1' THICK		RQD 84.3	PULL 10 FROM 37.7 To 42.8 RUN 5.1
41			CONTINUED ON SHEET 4			

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE

392.4

Hole No. RE-23

PROJECT

RICHARD B. RUSSELL DAM

INSTALLATION

CATHOLIN FALLS, S.C.

SHEET 4

OF 5 SHEETS

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV. ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
a	b	c	d	e	f	g
	40b		METADACITE (AS DESCRIBED)		Box 3	PULL 10 (CONTINUED)
	42		(GRADATIONAL CONTACT)	42.8		NOTE: SCALE CHANGED @ 40.0
	44		PORPHYRITIC META-DACITE			PULL 11
	46		MASSIVE, DENSE, META-IGNEOUS, HARD, LIGHT GRAY-GREEN, FRESH, NUMEROUS QUARTZ & FELDSPAR PHENO- CRYSTS	RQD 82.3 47.6	45.7 Box 4	FROM 42.8 To 47.6 RUN 4.8
	48					
	50		44.9 - 45.2 HIGH ANGLE FRACTURE, SMOOTH, SLIGHTLY ALTERED	RQD 89.7		PULL 12
	52		49.85 - 50.2 SUBHORIZONTAL FRACTURE PARTIALLY FILLED WITH GROUT?	52.45		FROM 47.6 To 52.5 RUN 4.9
	54		HIGH ANGLE FRACTURE SMOOTH, SLIGHTLY ALTERED	RQD		
	56		54.1 - 54.5 } HIGH ANGLE 55.3 - 55.55 } FRACTURES 55.65 - 55.90 } SL. ALTERED	86.6 57.3		PULL 13
	58					FROM 52.5 To 57.3 RUN 4.8
	60		58.6 - 58.9 } HEALED HIGH 59.2 - 59.5 } ANGLE FRACTURES SMOOTH	RQD 100		
	62		METADIABASE (AS DESCRIBED)		61.0	PULL 14
	64		NUMEROUS HEALED HIGH ANGLE FRACTURES EVERY 0.1' - 0.4' MAJORITY FILLED WITH CALCITE	RQD 57.7	61.75	FROM 57.3 To 61.8 RUN 4.5
	66					
	68		65.4 - 66.0 OPEN FRACTURES ALONG CORE AXIS - MOD. SMOOTH			PULL 15
	70		PROBABLY STRESS-RELIEF FRACTURE (COULD ALSO BE HYDROFRACTURE)	RQD 76.9		FROM 61.8 To 66.6 RUN 4.8
	72		68.6 - 68.8 SUBHORIZONTAL FRACTURE, OPEN, PARTIALLY FILLED WITH CALCIUM CARB- ONATE		71.15	
	74		PORPHYRITIC META-DACITE AS DESCRIBED			PULL 16
			73.3 - 73.6 HIGH ANGLE FRACTURE, OPEN, CALCITE FILLED, SMOOTH	J-17		FROM 66.6 To 71.2 RUN 4.6

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE
392.4

Hole No. RE-23

PROJECT

RICHARD B. RUSSELL DAM

INSTALLATION

CALTOON FALLS, S.C.

SHEET

OR 5 SHEETS

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV. ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
a	b	c	d	e	f	g
	74.6	+	METADIABASE (AS DESCRIBED)		Box 5	PULL 17 (CONTINUED)
	76	++		76.1	Box 5.5	
	78	++				PULL 18
	80	++		RQD 100		FROM 76.1 TO 81.1 RUN 5.0
	82	++	81.9' OPEN SUB-HORIZONTAL FRACTURE GROUT FILLED		81.05	
	84	++	83.75 - 84.15 HIGH ANGLE FRACTURE, SMOOTH CALCITE COATING	RQD 100		PULL 19 FROM 81.1 TO 85.6 RUN 4.5
	86	++		85.6		
	88	++	87.5 - 87.85 HIGH ANGLE FRACTURE, SMOOTH - CALC COATING	RQD 53.7		PULL 20 FROM 85.6 TO 90.4 RUN 4.8
	90	++		90.35		
	92	++			Box 7	PULL 21 FROM 90.4 TO 95.1 RUN 4.7
	94	++				
	96	++	95.1 BOTTOM OF BORING 96.5'	RQD 100 96.5		PULL 22 FROM 95.1 TO 96.5 RUN 1.4

DRILLING LOG			DIVISION SOUTH ATLANTIC	INSTALLATION CALHOUN FALLS, S.C.	SHEET 1 OF 6 SHEETS	
1. PROJECT RICHARD B. RUSSELL DAM			10. SIZE AND TYPE OF BIT NWX 11. DATUM FOR ELEVATION SHOWN (TBM or MSL)			
2. LOCATION (Coordinates or Station) 6+21			12. MANUFACTURER'S DESIGNATION OF DRILL			
3. DRILLING AGENCY SAVANNAH DISTRICT			13. TOTAL NO. OF OVER- BURDEN SAMPLES TAKEN DISTURBED UNDISTURBED			
4. HOLE NO. (As shown on drawing title and file number) RE-39			14. TOTAL NUMBER CORE BOXES 6			
5. NAME OF DRILLER			15. ELEVATION GROUND WATER			
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input checked="" type="checkbox"/> INCLINED 26° DEG. FROM VERT.			16. DATE HOLE STARTED COMPLETED			
7. THICKNESS OF OVERTBURDEN C.C			17. ELEVATION TOP OF HOLE 390.1			
8. DEPTH DRILLED INTO ROCK 91.9			18. TOTAL CORE RECOVERY FOR BORING NA			
9. TOTAL DEPTH OF HOLE 91.9			19. SIGNATURE OF INSPECTOR JAMES E. BOLEN (SEE NOTES 1 & 3 SHOWN)			
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV- ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
a	b	c	d	e	f	g
			METADIAPASE (DIKE MATERIAL) HIGHLY FRACTURED AND WEATHERED (PULL 1)		Box 1	PULL 1 FROM C.C To 4.6 RUN 4.6
1						
2			GROUT			
3			GROUT POSSIBILITY			
4			DARK BROWN METALLIC RUST			
5			GROUT			
6				4.6		
7						PULL 2 FROM 4.6 To 10.0 RUN 5.4
8			GROUT			
9						
10			GROUT HEALED FRACTURE	10.0		
11			FB			PULL 3 FROM 10.0 To 13.1 RUN 3.1
12			GROUT			
13			FG			
			PYRITE CRYSTAL			
			CONTACT GROUT			
			Continued on SHEET 2			
				J-19		

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE

390 I

Hole No. RE - 39

PROJECT

RICHARD B. RUSSELL DAM

INSTALLATION

CALHOUN FALLS S.C.

SHEET 2

OF 6 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV. e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
13	13.5			13.1	Box 1	PULL 4 FROM 13.1 To 17.9 RUN 4.8
14	14.0		FROM 13.5 TO 14.6 FRACTURES ARE COATED WITH LIGHT RUST			
15	14.5		FRAGMENTED AREA SOME GROUT POSSIBLE			
16	15.0		LIGHT BROWN RUST YELLOWISH-GREEN TO METALLIC RUST WITH SMALL FAN PYRITE CRYSTALS		Box 2	
17	15.5		SEVERAL LARGE PYRITE CRYSTALS BROKEN THROUGH HEALED FRACTURE	17.9		
18	16.0		FB WITH A FEW SMALL PYRITE CRYSTALS			PULL 5 FROM 17.9 To 22.9 RUN 5.0
19	16.5		FB PYRITE CRYSTALS			
20	17.0		0.05 GROUT FILLED JOINT RUST			
21	17.5		GROUT RUST			
22	18.0		YELLOW GREEN PYRITE CRYSTALS CORE SPIN PYRITE CRYSTALS	22.9		
23	18.5		GROUT FILLED			PULL 6 FROM 22.9 To 25.9 RUN 3.0
24	19.0		GROUT AND RUST - DARK RUST			
25	19.5		DARK RUST			
26	20.0		RUSTY WITH PYRITE			
27	20.5		FB PYRITE WHITE CHALK			
28	21.0		GREENISH RUST			
29	21.5		GREENISH AND PYRITE			
30	22.0		CORE LOSS	25.9		
	22.5		BADLY FRAGMENTAL $>\frac{1}{4}$ " TO 2"			
	23.0		APPROX 50% CORE LOSS			
	23.5		MOST BREAKS RUSTY BUT A LITTLE OF WHITE CHALKY			
	24.0		MATERIAL			
	24.5		CORE LOSS	28.2		PULL 7 FROM 25.9 To 28.2 RUN 2.3
	25.0		DIRTY DUSTY RUST			
	25.5		DULL BROWN RUST STAIN			
	26.0		CONTINUED ON SHEET 3			
	26.5					
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DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE

390±

Hole No. RE-39

PROJECT
RICHARD B. RUSSELL DAMINSTALLATION
CALHOUN FALLS, S.C.SHEET 3
OR 6 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV. ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	30					PULL 8 (CONTINUED)
	31					
	32					
	33	FB	CHALKY WHITE MATERIAL	33.1		
	34	BRIGHT RUST DULL RUST BRIGHT RUSTY DARK METALLIC SOME GROUT?				PULL 9 FROM 33.1 TO 37.7 RUN 4.6
	35	GREENISH RUST				
	36	WHITE CHALKY BLACK METALLIC HEALED				
	37	FB GREENISH WITH PYRITE		37.7		
	38	BLACK METALLIC MATERIAL PYRITE FB FB				PULL 10 FROM 37.7 TO 42.5 RUN 4.8
	39	WHITE CHALKY BLACK METALLIC HEALED JOINT				
	40					
	41					
	42	CORESPIN		42.5		
	43					
	44	BOTH APPEAR FRESH BUT HAVE VERY LIGHT WHITE COLOR				PULL 11 FROM 42.5 TO 47.4 RUN 4.9
	45	CHALKY WHITE				
	46	FB LOWER BREAK QUARTZ CRYSTAL SIGHT GREEN TINT WITH PYRITE				
	47	CONTINUED ON SHEET 4			Box 4	

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE
390 ±

Hole No. RE - 39

SHEET 4
OF 6 SHEETSPROJECT
RICHARD B. RUSSELL DAMINSTALLATION
CATHOLIN FALLS, S.C.

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV. ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
				e	f	g
47b	47.4	c		47.4	Box 4	
48		FB				PULL 12
49		WHITE GRAY LIGHT GREEN TINT				FROM 47.4 To 51.0 RUN 3.6
50		LIGHT GRAY LOOKS LIKE GROUT 1/2" QUARTZ SEAM				
51		FG	SOME VERY LIGHT GRAY - COATING - SEVERAL QUARTZ FILLED Joints PULL 12	51.0		PULL 13
52						FROM 51.0 To 54.2 RUN 3.2
53						
54			BLACK SOOTY WITH SEVERAL PYRITE CRYSTALS	54.2		PULL 14
55		REDDISH				FROM 54.2 To 59.0
56		PALE GRAY				RUN 4.2
57			DARK ALMOST BLACK FB?			
58			PALE GRAY - SEVERAL HEALED FRACTURES IN THE AREA			
59			REDDISH - RUST WITH CHALKY WHITE GROUT	59.0		
60		FB				
61		DARK FB				
62		DULL GRAY				
63			DULL GRAY FB		62.C Box 5	
64			CONTINUED ON SHEET 5			

DRILLING LOG (Cont Sheet)

EL E V A T I O N T O P O F H O L E

390 *t*

Hole No. RE - 39

memorandum

~~RECEIVED~~ RICHARD B. RUSSELL, D.A.M.

INSTALLATION

CALHOUN, FALES, S.C.

1 SHEETS

OF 6 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV. ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
64.0	FB		FB			
65			DULL METALLIC BLACK FB WITH PYRITE	65.1	Box 5	PULL 15 (CONTINUED)
66						PULL 16
67						FROM 65.1 To 69.9 RUN 4.8
68			PULL 16 APPEARS ALL BREAKS ARE FRESH WITH PYRITE CRYSTALS			
69						
70			DARK COLOR WITH PYRITE ONE HEALED FRACTURE OVER 3' LONG	69.9		PULL 17
71			PYRITE			FROM 69.9 To 74.8
72			LIGHT GRAY			RUN 4.9 REC CL
73			LIGHT GRAY TO WHITE GROUT POSSIBILITY			
74			PYRITE METALLIC GRAY LIGHT GRAY WITH BAND OF PYRITE - LIGHT GRAY			
75			GROUT POSSIBILITY - PYRITE	74.8		PULL 18
76			GREENISH - METALLIC - PYRITE			FROM 74.8 To 79.6
77			SLIGHT GREENISH TINT METALLIC WITH PYRITE		77.2	RUN 4.8 REC CL
78			METALLIC WITH SEVERAL PYRITE CRYSTALS		Box 6	
79			GRAY SOME WHITE - MOSTLY DARK METALLIC WITH A FEW			
80			DARK METALLIC	79.6		
81			GREENISH DARK METALLIC LIGHT GRAY			PULL 19
			CONTINUED ON SHEET 6			
						J-23

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE

390±

Hole No. RE-39

PROJECT
KICHARD B. RUSSELL DAMINSTALLATION
CANTON FALLS, S.C.SHEET 6
OF 6 SHEETS

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV. ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc. if significant)
a	b	c	d	e	f	g
	81		GRAY TO DULL METALLIC WITH PYRITE		Box 6	PULL 19
	82					FROM 79.6 To 84.5 RUN 4.9
	83		PALE GRAY COATING WITH PYRITE CRYSTALS			
	84			84.5		
	85					PULL 20
	86		HEALED FRACTURE			FROM 84.5 To 89.3 RUN 4.8
	87					
	88		FB QUARTZ AND PYRITE			
			FB LIGHT GRAY. PYRITE			
	89		FB PYRITE	89.3		
	90		LOWER 20' OF CORE HAS NUM- EROUS HEALED FRACTURES, GRAY- WHITE FILLED, FROM $1/16"$ TO $3/8"$ AVERAGE ABOUT $1/4"$			PULL 21
	91					FROM 89.3 To 91.9 RUN 2.6
			BOTTOM OF BORING 91.9	91.9		
			NOTES:			
			1) JAMES E. BOLEN DID NOT PHYSICALLY INSPECT THE CORE DEPICTED ON THIS LOG. AN ATTEMPT WAS MADE ON HIS BEHALF TO REPRODUCE AN EARLIER COPY OF THIS LOG INTO A FORM MORE FREQUENTLY USED BY THE SAVANNAH DISTRICT.			3) THE AUTHOR OF THE ORIGINAL LOG WAS NOT DOCUMENTED AND IS AT THIS WRITING (JAN 1987) UNKNOWN.
			2) A GRAPHIC LEGEND WAS USED IN LIEU OF THE STANDARD "ROCK" LEGEND PRESUMABLY FOR THE PURPOSE OF ILLUSTRATING JOINTS AND OTHER ROCK DIS- CONTINUITIES.		J-24	

DRILLING LOG		DIVISION SOUTH ATLANTIC	INSTALLATION CALHOUN FALLS, S.C.	SHEET 1 OF 1 SHEETS	
1. PROJECT RICHARD B. RUSSELL DAM		10. SIZE AND TYPE OF BIT N.W.X			
2. LOCATION (Coordinates or Station) 45 + 72		11. DATUM FOR ELEVATION SHOWN (TBM or MSL) MSL			
3. DRILLING AGENCY SAVANNAH DISTRICT		12. MANUFACTURER'S DESIGNATION OF DRILL			
4. HOLE NO. (As shown on drawing title and file number) RE-4-C		13. TOTAL NO. OF OVER- BURDEN SAMPLES TAKEN DISTURBED UNDISTURBED			
5. NAME OF DRILLER		14. TOTAL NUMBER CORE BOXES 6			
6. DIRECTION OF HOLE <input checked="" type="checkbox"/> VERTICAL <input type="checkbox"/> INCLINED DEG. FROM VERT.		15. ELEVATION GROUND WATER			
7. THICKNESS OF OVERTBURDEN C.C		16. DATE HOLE STARTED COMPLETED			
8. DEPTH DRILLED INTO ROCK 92.2		17. ELEVATION TOP OF HOLE			
9. TOTAL DEPTH OF HOLE 92.2		18. TOTAL CORE RECOVERY FOR BORING 88			
19. SIGNATURE OF INSPECTOR JAMES E. Bolen (SEE NOTES SHEET 6)					
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)	
a	b	c	d	RECOVERY %	BOX #
			EXCEN GROUT - WEATHERED WHITE		
			BRIGHT RUST		
		1	VERY PALE GREEN		
		2	CORE SPIN - BOTH BREAKS WEATHERED WITH DARK BROWN -METALLIC APPEARANCE	85	PULL 1 FROM C.C To 1C.C RUN 1C.C RBC 8.5 CL 1.5
		2	HEALED FRACTURE VERY PALE GREEN		
		2	BRIGHT YELLOW RUST		
		2	OLD BREAK SICK FINISH - PALE GREEN		
		4	FG1 METALLIC		
		4	FB PALE GREEN CRYSTALS		
		5	OLD GROUT SOME CORE SPIN		
		6			
		7	FG1 SOME LARGE PALE BLUE QUARTZ CRYSTALS		
		8	FG PALE GREEN AND BLUE CRYSTALS		
		9			
		10		10.0	
		11	ALL APPEAR TO BE FRESH BREAKS	100	PULL 2 FROM 10.C To 12.C RUN 2 C RBC 2.C CL C.C
		12		12.0	
		13	CONTINUED ON SHEET 2	J-25	PULL 3

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE

Hole No. RE-4C

PROJECT

RICHARD B. RUSSELL D&I

INSTALLATION

CALHOUN FALLS, S.C.

SHEET 3
OF 6 SHEETS

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV. ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
a	b	c	d	e	f	g
			OLD BREAK DARK METALLIC WITH GREEN TINT		Box 2	PULL 5 (CONTINUED)
31			OLD BREAK PYRITE PRESENT RED STREAK ACROSS CORE BAD CORE SPIN BUT APPEAR TO BE OLD JOINTS GREENISH-YELLOW	31.5	Bcx 3	PULL 6 FROM 31.5 TO 41.9 RUN 10.4 REC 8.6 CL 1.8
32						
33			GREENISH-YELLOW			
34					83	
35			LOW ANGLE HEALED FRACTURE FG			
36			QUARTZ SEAM			
37			CALCITE FILLED			
38						
39			CALCITIC FB SMALL AMOUNT OF PALE YELLOW			
40						
41			HEAVY QUARTZ CONCENTRATION			
42			FB	41.9		PULL 7 FROM 41.9 TO 51.6 RUN 9.7 REC 7.5 CL 2.2
43			PALE GREEN FB			
44			OLD QUARTZ FILLED FRACTURE		77	
45						
46			DARK METALLIC WITH PALE GREEN			
47			CONTINUED ON SHEET 4			
					J-21	

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE

Hole No. RE-4C

PROJECT RICHARD B. RUSSELL DAM

INSTALLATION CALHOUN FILLS, S.C.

SHEET 4

OF 6 SHEETS

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV. ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
a	b	c	d	e	f	g
470			LOW ANGLE FRACTURES HIGH ANGLE FRACTURE RUSTY GROUT FILLED	FILLED (GROUT)	Box 4	PULL 7 (CONTINUED)
48						
49						
50			OLD FRACTURES - LOOKS LIKE THIN GROUT			
51			GROUT	51.6		
52						PULL 8
53						FROM 51.6 TO 58.9
54			PALE YELLOWISH TINT LARGE AMOUNT OF QUARTZ CRYSTALS	89		RUN 7.3 REC 6.5 CL 0.8
55			PALE GREEN METALLIC VUGS QUARTZ LINED			
56			METALLIC WITH CORE SPIN			
57						
58			FB WITH PALE GREENISH TINT			
59			GROUT? WITH RUST FB APPEARS WITH PALE GREENISH TINT	58.9		
60						PULL 9
61				94		FROM 58.9 TO 67.5
62			HEAVY CONCENTRATION OF QUARTZ			RUN 8.6 REC 8.1 CL 0.5
63			FD PYRITE		62.2 Box 5	
64			PALE BLUE QUARTZ CRYSTALS CONTINUED ON SHEET 5			
						J-28

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE

Hole No. RE-40

PROJECT
RICHARD B. RUSSELL DAMINSTALLATION
CALHOUN FALLS, S.C.SHEET 5
OF 6 SHEETS

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV- ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
a	b	c	d	e	f	g
	640				Box 5	PULL 9 (CONTINUED)
	65		CALCITIC OR GROUT			
	66		PALE GREEN CRYSTALS			
	67		DARK METALLIC OLD HEALED FRACTURES			
	68		QUARTZ CRYSTALS GREENISH WITH QUARTZ AND GROUT - COULD BE FAULT ZONE	67.5		
	69		OLD FRACTURE - POSSIBILITY OF SOME GROUT			
	70		FD PALE YELLOWISH & BLUE CRYSTALS			
	71			99		
	72					
	73					
	74		AS ABOVE BREAK			
	75					
	76					
	77			77.4		
	78		GREENISH-YELLOW WITH GROUT PALE YELLOWISH-GREEN WITH QUARTZ HEALED FRACTURE		78.0	
	79		GRAY	83	Box 6	
	80		DARK METALLIC			
	81		CONTINUED ON SHEET 6			
				J-29		

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE

Hole No. RE-4C

PROJECT
RICHARD B. RUSSELL DAMINSTALLATION
CAUTOLIN FALLS, S.C.SHEET 6
OF 6 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV. ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
	81	b	CORE SPIN			PULL 11 (CONTINUED)
82			OLD HEALED FRACTURE - GREENISH GREENISH, YELLOW WITH PALE BLUE QUARTZ CRYSTALS	82.2		PULL 12
83						FROM 82.2
84			OB DARK METALLIC WITH PALE BLUE QUARTZ 1/2" QUARTZ FILLED FRACTURE			TO 92.2
85						RUN 10.0
86			DARK METALLIC	94		REC 9.4
87						CL C.6
88						
89			OLD HEALED QUARTZ FILLED FRACTURES			
90			OB CORSPIN WITH REDDISH STREAKS			
91			QUARTZ FILLED FRACTURES			
92			BOTTOM OF BORING 92.2'			
			NOTES:			
			1.) JAMES E. BOLEN DID NOT ON THIS LOG. AN ATTEMPT PRODUCE AN EARLIER COPY FREQUENTLY USED BY THE REPRESENTS THAT ATTEMPT.	PHYSICALLY WAS MADE OF THIS LOG SAVANNAH DISTRICT. THIS DOCUMENT	INSPECT THE CORE DEPICTED ON HIS BEHALF TO RE- INTO A FORM MORE	
			2.) A GRAPHIC LEGEND WAS USED IN LIEU OF THE STANDARD "ROCK" LEGEND PRESUMABLY FOR THE PURPOSE OF ILLUSTRATING JOINTS AND OTHER ROCK DISCONTINUITIES.			
			3.) THE AUTHOR OF THE ORIGINAL LOG IS AT THIS WRITING (JAN 1987) UNKNOWN.			
					J-30	

DRILLING LOG	DIVISION SOUTH ATLANTIC	INSTALLATION CALHOUN FALLS, S.C.	SHEET 1 OF 6 SHEETS
1. PROJECT	10. SIZE AND TYPE OF BIT 1 1/2		
R. B. RUSSELL DAW	11. DATUM FOR ELEVATION SHOWN (TBM or MSL)		
2. LOCATION (Coordinates or Station) 44 + 11 STA. CN S.C. EARTH EMBANKMENT	MSL		
3. DRILLING AGENCY SAVANNAH DISTRICT	12. MANUFACTURER'S DESIGNATION OF DRILL SMCO		
4. HOLE NO. (As shown on drawing title and file number)	13. TOTAL NO. OF OVER- BURDEN SAMPLES TAKEN		
RE-42	DISTURBED UNDISTURBED		
5. NAME OF DRILLER WILLIAM T. (OF BOYLES BROS.)	14. TOTAL NUMBER CORE BOXES		
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input checked="" type="checkbox"/> INCLINED 20° DEG. FROM VERT.	15. ELEVATION GROUND WATER		
7. THICKNESS OF OVERTURDEN C.C	16. DATE HOLE STARTED 26 JAN 1981		
8. DEPTH DRILLED INTO ROCK 29.9	17. ELEVATION TOP OF HOLE 40.8 I SST.		
9. TOTAL DEPTH OF HOLE 29.9	18. TOTAL CORE RECOVERY FOR BORING NA		
19. SIGNATURE OF INSPECTOR JAMES E. BOLEN (SEE NOTES SHEET 6)			

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS	% CORE RECOV- ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
			(Description)			
a	b	c	d	e	f	
			FRESH BREAKS POSSIBLY ALONG OLD HEALED FRACTURES			PULL 1
1			BREAK ALONG HEALED FRACTURES CALCITIC FILL			
2						
3			FRACTURES FILLED WITH A MILKY WHITE TO LIGHT GRAY			
4						
5			LIGHT TAN TO YELLOW WEATHERED LOOK WITH CORROSION			PULL 2
6			MAYBE SOME CLAY FILL SMALL ROCK FRAGMENTS LOOKS LIKE CALCITIC FILLED FRACTURES YELLOWISH GREEN			
7			STREAK ALMOST WITH LONG AXIS OF CORE			
8			FB			
9			FB			
10			FG			
11			FB			
12			FB			
13			FB			
			SEAM OF QUARTZ			
			CONTINUED ON SHEET 2			

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE
408 II

Hole No. RE - 42

PROJECT

RICHARD B. RUSSELL DAM

INSTALLATION

CALHOUN FALLS, S. C.

SHEET 2

OF 6 SHEETS

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV. ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
a	b	c	d	e	f	g
	13					PULL 4 (CONTINUED)
	14		FB			
	15		FB SOME DISCOLORATION FROM BEING DROPPED FROM CORE BARREL			
	16		PROKE THROUGH QUARTZ SEAM			
	17		FB			PULL 5
	18		17.6 - 17.7 DARK METALLIC WITH SHINY FLAKES			
	19		FB CORE SPIN			
	20		FB			
	21		FB			PULL 6
	22		BRIGHT RUSTY COLORING			
	23		FB			
	24		FB			
	25		FB			
	26		FB			PULL 7
	27		FB			
	28		FB			
	29					
	30		CONTINUED ON SHEET 3			

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE
408 ±

Hole No. RE - 42

PROJECT

RICHARD B. RUSSELL DAM

INSTALLATION

CALHOUN FALLS, S.C.

SHEET 3

OF 6 SHEETS

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV. ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
a	b	c	d	e	f	g
	30	b	FB			PULL 7 (CONTINUED)
	31		BREAK ALONG THIN QUARTZ SEAM 0.05			PULL 8
	32		FB			PULL 9
	33		FRAGMENT LOOKS LIKE THIN QUARTZ SEAMS THAT THE DRILL BROKE UP			
	34		THIN QUARTZ SEAMS FG HEALED FRACTURES @ 60° TO AXIS OF CORE			
	35		FB			PULL 10
	36		FG			
	37		FB			PULL 11
	38		FB SOME QUARTZ			
	39		FB			
	40		QUARTZ SEAM			PULL 12
	41		ONE LARGE HEALED FRACTURE RUNNING ALMOST WITH THE AXIS OF THE CORE			
	42		FB			
	43		FB			
	44		FB			PULL 13
	45		FB			
	46		FB			
	47		FB CONTINUED ON SHEET 4			

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE
408 ±

Hole No. RE-42

1 SHEET 4
OF 6 SHEETS

PROJECT

RICHARD B. RUSSELL DAM

INSTALLATION

CALHOUN FALLS, S.C.

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV. ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
a	b	c	d	e	f	g
	47b					PULL 14
	48					
	49					
	50					
	51		FB FINER GRAIN MATERIAL STILL SAME COLOR			PULL 15
	52		FB THIN QUARTZ SEAM			
	53					
	54		FB? CORE SPIN			
	55		FB FB HEALED FRACTURES } FINER FB GRAINED MATERIAL			PULL 16
	56					
	57		FB			
	58		FB			PULL 17
	59		FB			
	60		PALE POSSIBILITY CALCITIC MATERIAL			
	61		BLACK METALLIC MATERIAL GREENISH - YELLOW WITH MICA FLAKES			
	62					
	63		FB			PULL 18
	64		CONTINUED ON SHEET 5			

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE

408±

Hole No. RE-42

PROJECT
RICHARD B. RUSSELL DAMINSTALLATION
CALHOUN FALLS, S.C.SHEETS
1 OF 6 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV. e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g	
	640						
	65						
	66						
	67						
	68						
	69						
	70						
	71						
	72						
	73						
	74						
	75						
	76						
	77						
	78						
	79						
	80						
	81		CONTINUED ON SHEET 6				

DRILLING LOG (Cont Sheet)

EL E V A T I O N T O P O F H O L E
402 1/2

Hole No. RE - 42

mojo

PROJECT
RICHARD B. RUSSELL DAM

INSTALLATION

CATHEDRAL FALLS, S.C.

SHEET 6
OF 6 SHEETS

LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV- ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
ELEVATION	DEPTH			
81 b	c	d	e	f
82				
83				
84				
85				
86				
87	FILLED WITH LIGHT TAN MATERIAL			
88	FB SEVERAL OLD HEALED FRACTURES IN THIS LAST 2 FEET			
89	APPEARS FRESH BUT IN SAME DIRECTION AS ABOVE AND IN OTHER RUNS			
	FB MORE HEALED FRACTURES AT APPROX 30° TO CORE			
	POSITION OF BORING 899	TD 89.9		PULL 26

Notes:

- 1.) JAMES E. BOLEN DID NOT PHYSICALLY INSPECT THE CORE DEPICTED ON THIS LOG. AN ATTEMPT WAS MADE ON HIS BEHALF TO REPRODUCE AN EARLIER COPY OF THIS LOG INTO A FORM MORE FREQUENTLY USED BY THE SAVANNAH DISTRICT. THIS DOCUMENT REPRESENTS THAT ATTEMPT.
 - 2.) A GRAPHIC LEGEND WAS USED IN LIEU OF THE STANDARD "ROCK" LEGEND PRESUMABLY FOR THE PURPOSE OF ILLUSTRATING JOINTS AND OTHER ROCK DISCONTINUITIES.
 - 3.) THE AUTHOR OF THE ORIGINAL LOG WAS NOT RECORDED AND IS AT THIS WRITING (JAN 1987) UNKNOWN.

DRILLING LOG		DIVISION SOUTH ATLANTIC	INSTALLATION CAHOURN FALLS, S.C.	SHEET 1 OF 6 SHEETS		
1. PROJECT RICHARD B. RUSSELL DAM		10. SIZE AND TYPE OF BIT 1 1/2"				
2. LOCATION (Coordinates or Station) STA. 44+74 S.C. EMBANKMENT		11. DATUM FOR ELEVATION SHOWN (TDB or msl) MSL				
3. DRILLING AGENCY SAVANNAH DISTRICT		12. MANUFACTURER'S DESIGNATION OF DRILL SIMCO				
4. HOLE NO. (As shown on drawing title and file number) RE-43		13. TOTAL NO. OF OVER-BURDEN SAMPLES TAKEN		DISTURBED	UNDISTURBED	
5. NAME OF DRILLER WILLIAM HILL & KEVIN POWER (Boyles Bros)		14. TOTAL NUMBER CORE BOXES 6				
6. DIRECTION OF HOLE <input type="checkbox"/> VERTICAL <input checked="" type="checkbox"/> INCLINED 20° DEG. FROM VERT.		15. ELEVATION GROUND WATER				
7. THICKNESS OF OVERTBURDEN 0.3		16. DATE HOLE STARTED 19 JAN 1981 COMPLETED 21 JAN 1981				
8. DEPTH DRILLED INTO ROCK 91.2		17. ELEVATION TOP OF HOLE 425'				
9. TOTAL DEPTH OF HOLE 91.5		18. TOTAL CORE RECOVERY FOR BORING NA				
		19. SIGNATURE OF INSPECTOR JAMES E. BOLIN (SEE NOTES SHEET 1)				
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)		REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)	
			a	b		c
0	0		HIGHLY WEATHERED AND FRACTURED BROKEN SURFACES COATED WITH RED CLAY		Box 1	PULL 1
1			APPROX. 2.0' TO 2.5' LIGHT AND LOOSE			
2						
3						
4						
5			HIGHLY WEATHERED - FRACTURED BROKEN SURFACES COATED WITH CLAY			PULL 2
6			APPROX 2.0 FEET (SOSE)			
7						
8			CONTACT BREAKS COATED WITH PALE GREENISH - WHITE MATERIAL			PULL 3
9						
10			CORE LOSS IN THIS AREA			
11						
12			BREAKS IN THIS 1.5' LENGTH ARE COATED WITH A RUSTY BROWN COLOR			
13			CONTACT CONTINUED ON SHEET 2			PULL 4

DRILLING LOG (Cont Sheet)

EL E V A T I O N T O P O F H O L E
425 ±

Hole No. RE-43

2016

PROJECT RICHARD B. RUSSELL DAM INSTALLATION CALHOUN FALLS, S.C.

INSTALLATION

1 SHEET 2

1 OF 6 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV- ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
						Box 1
13	13 b	c				PULL 4 (CONTINUED)
14						
15			ALL BREAKS IN RUN 4 ARE IN THE GENERAL DIRECTION APPROX. 0.05' DIP IN CORE WIDTH ALL ARE COATED WITH DULL RUSTY TO A BRIGHT YELLOW- ISH RUSTY COLOR - EVEN THE HIGH ANGLE AT TOP OF RUN			
16						
17					Box 2	
18			THESE BREAKS IN SAME DIRECTION COATED WITH LIGHT GRAY-WHITE MAT- ERIAL			PULL 5
19			CLAY FILLED JOINT (ALL BREAKS SEEM TO DIP IN THE SAME DIRECTION)			
20			LIGHT GRAY MATERIAL			
21			CLAY FILLED JOINT			
22			RUSTY COLORED			
23			LIGHT GRAY. GREENISH			
24			FB			
25						
26			BREAKS FILLED WITH LIGHT GRAY MATERIAL			PULL 7
27			GREENISH-YELLOW MATERIAL CONTACT			
28			GRAY. WHITE (GREAT NUMBER OF HEALED FRACTURES)			
29			GRAY. WHITE (GRAY. WHITE)			PULL 8
30			BRIGHT YELLOWISH GREEN			
			BRIGHT RUSTY			
			YELLOWISH. WHITE			
			(POSSIBLE FAULT ZONE)			
			RUSTY COLOR			
			HIGHLY FRACTURED ZONE			
			MOSTLY HEALED FRACTURES			
			CONTINUED ON SHEET 3			PULL 9

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE
425±

Hole No. RE-43

PROJECT

RICHARD B. RUSSELL DAM

INSTALLATION

CALHOUN FALLS, S.C.

SHEET 3

OF 6 SHEETS

ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV. ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
a	b	c	d	e	f	g
	30b		FRACTURES		Box 2	PULL 9 (CONTINUED)
	31		CONTACT			
	32		FB YELLOW MATERIAL		Box 3	
	33		RUSTY TO PALE GREENISH-YELLOW			PULL 10
	34		POSSIBLE FAULT OR SMALL DIKE			
	35		RUSTY YELLOW			
	36		LONG FRACTURE FILLED WITH BLACK SOOTY MATERIAL			
	37		YELLOW RUSTY BROWN			
	38		FROM POSSIBLY FAULT OR DIKE			
	39		TO END OF RUN			
	40		SEVERAL OLD HEALED FRACTURES			
	41		WHITE MATERIAL CORE SPIN			
	42					PULL 11
	43					
	44					
	45					
	46					
	47		CONTINUED ON SHEET 4			

DRILLING LOG (Cont Sheet)

ELEVATION TOP OF HOLE
425 ±

Hole No. RE-43

PROJECT
RICHARD B. RUSSELL DAMINSTALLATION
Carolina Falls, S.C.SHEET 4
OF 6 SHEETS

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV. ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g
470	470		LIGHT COLOR CORE SPIN		Box 4	PULL 13 (CONTINUED)
			FG			
48						PULL 14
49			WHITE CALCITIC			
50			FB WHITE CALCITIC			
51						
52			FB			PULL 15
53			FB			
54			FG			
54			FB			
54			FB			
54			CORE SPIN			
55			VERY PALE YELLOW	DIPPING IN SAME DIRECTION AND ANGLE		
56						
57			FB			PULL 16
58			FB			
58						
59			PALE WHITE MATERIAL			
60						
61			FB		Box 4	
61			FB		Box 5	PULL 17
62			FG			
62						
63			FB			
63						
64			BREAKS IN THIS SYSTEM ALL COATED WITH WHITE TO DARK GRAY MATERIAL CONTINUED ON SHEET 5			

DRILLING LOG (Cont Sheet)			ELEVATION TOP OF HOLE 425 ±	Hole No. RE-43		
PROJECT RICHARD B. RUSSELL DAM	INSTALLATION CALHOUN FALLS, S.C.					SHEET 5 OF 6 SHEETS
ELEVATION	DEPTH	LEGEND	CLASSIFICATION OF MATERIALS (Description)	% CORE RECOV- ERY	BOX OR SAMPLE NO.	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant)
a	b	c	d	e	f	g
			FB		Box 5	PULL 17 (CONTINUED)
65			FB			
66			FB			
67			FB			
68			OLD WHITE FILLED FRACTURE			
69			FB			
70			WHITE COATING DARK GRAY METALLIC MATERIAL			PULL 19
71			CORE SPIN			
72			FB			
73			FB NEAR OLD HEALED FRACTURE			
74			WHITE CALCITIC MATERIAL			
75			WHITE MATERIAL			PULL 20
76			WHITE COATING			
77			WHITE COATING			
78			FB WHITE COATING WITH CORE SPIN		Box 5 Box 6	
79			CONTACT WHITE COATING			
80			WHITE COATING			
81			WHITE			
			FB			
			BROKEN UP ALONG OLD FRACTURES AND CONTACT LINE WHITE COATING ON CONTACT			
			BREAKS APPEAR FRESH BUT SLIGHT ORIENTATION AND SLIGHT DIP - POSSIBLE OLD FRACTURES			
			CONTINUED ON SHEET 6			

DRILLING LOG (Cont Sheet)

EL E V A T I O N T O P O F H O L E
425 $\frac{1}{2}$

Hole No. RE-43

SHEET 6
OF 6 SHEETS

PROJECT
RICHARD B. RUSSELL DAM

INSTALLATION
CALHOUN FALLS, S.C.

ELEVATION a	DEPTH b	LEGEND c	CLASSIFICATION OF MATERIALS (Description) d	% CORE RECOV- ERY e	BOX OR SAMPLE NO. f	REMARKS (Drilling time, water loss, depth of weathering, etc., if significant) g	
81	81 b		WHITE COATING			Box 6	PULL 21
82			FB				PULL 22
83			LIGHT WHITE COATING CORE SPIN				
84			CONTACT				
84			FB				
84			FB				
85			WHITE COATING				
85			CONTACT				
86			APPEARS FRESH BUT PALE GREEN CORESPIN COATING				
86			PALE YELLOW COATING				
87			FB				PULL 23
87			PALE YELLOW				
87			PALE YELLOW				
88			FB				
89			PALE YELLOW				
89			WHITE COATING				
90			FB				
90			FB				
90			WHITE COATING				
91			Bottom of Boring 91.5'	91.5	Tb		
			NOTES:				
			1.) JAMES E. BOUD DID NOT PHYSICALLY INSPECT THE CORE DEPICTED ON THIS LOG. THIS DOCUMENT REPRESENTS AN ATTEMPT TO REPRODUCE AN EARLIER LOG INTO A FORM MORE GENERALLY USED BY THE SAVANNAH DISTRICT.				
			2.) A GRAPHIC TYPE LEGEND WAS USED IN LIEU OF THE MORE FREQUENTLY USED "ROCK" STYLE LEGEND - PRESUMABLY FOR THE PURPOSE OF ILLUSTRATING JOINTS AND OTHER DISCONTINUITIES IN THE CORE.				
			3.) THE AUTHOR OF THE ORIGINAL LOG IS AT THIS WRITING (JAN. 1987) UNKNOWN.				

Notes:

- 1.) JAMES E. BOWEN DID NOT PHYSICALLY INSPECT THE CORE DEPICTED ON THIS LOG. THIS DOCUMENT REPRESENTS AN ATTEMPT TO REPRODUCE AN EARLIER LOG INTO A FORM MORE GENERALLY USED BY THE SAVANNAH DISTRICT.
- 2.) A GRAPHIC TYPE LEGEND WAS USED IN LIEU OF THE MORE FREQUENTLY USED "ROCK" STYLE LEGEND - PRESUMABLY FOR THE PURPOSE OF ILLUSTRATING JOINTS AND OTHER DISCONTINUITIES IN THE CORE.
- 3.) THE AUTHOR OF THE ORIGINAL LOG IS AT THIS WRITING (JAN. 1987) UNKNOWN.

APPENDIX K

RICHARD B. RUSSELL PROJECT PHOTOS

APPENDIX K

RICHARD B. RUSSELL PROJECT PHOTOS

<u>Photograph</u>	<u>Description</u>	<u>Page</u>
Diversion Channel:		
1	Looking downstream thru diversion channel showing sedimentation pond and Clark Hill reservoir.	K-13
2	Looking upstream at diversion channel.	K-13
3	Dravo crane crossing service bridge of diversion channel.	K-14
4	Looking east across diversion channel, along axis of dam.	K-14
5	Diversion channel excavation after second stage diversion - viewing southeast from west bank of Georgia cutoff trench.	K-15
6	Diversion channel excavation after second stage diversion - viewing south.	K-15
7	Diversion channel excavation after second stage diversion - viewing west. Note downstream slope of cutoff trench being dressed by Groves.	K-17
Cofferdike:		
8	General view of cofferdike looking west.	K-18
9	Cofferdike - slurry trench, looking west showing fracture leading into trench.	K-18
10	Cofferdike - slurry trench excavation.	K-19
Excavation and Blasting:		
11	Detonation of Blast Pattern 1001, South Carolina abutment.	K-21
12	Blast Pattern 1007 after blast, looking west.	K-21

RICHARD B. RUSSELL PROJECT PHOTOS

<u>Photograph</u>	<u>Description</u>	<u>Page</u>
13	View from near South Carolina tailrace wall. Blast Pattern 1242 Monoliths 13 and 14 about 360' right of centerline.	K-22
14	Blast No. 112, Georgia abutment.	K-22
15	Tailrace Class I excavation standing at station 30 + 00 looking east.	K-23
16	Blast Pattern 1021 detonation - South Carolina abutment.	K-23
17	Mod "G" - standing 800' downstream of station 27 + 00, looking northeast.	K-24
18	Mod "G" - standing 800' downstream of station 27 + 00, looking north.	K-24
19	Looking west into west retaining wall foundation area - near horizontal wall seam is at El. 307.	K-25
20	Standing in Monolith 16, looking west during excavation.	K-25
21	Clean-up in Monolith 30 after blasting, looking west.	K-26
22	Lane drillers on production shot downstream of draft tubes. Foreman (Frank Poes) reported difficulty with seam at about elevation 258'.	K-26
23	Georgia abutment - Dravo cleanup crew in foreground, Lane crew in background.	K-27
Concrete Dam General:		
24	Early dam construction - mod "L".	K-29
25	Preparing to place concrete on monolith surfaces.	K-29
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DIVERSION CHANNEL PHOTOS



Photo 1 - Looking downstream thru diversion channel showing sedimentation pond and Clark Hill Reservoir (March 1978)



Photo 2 - Looking upstream at diversion channel (March 1978)

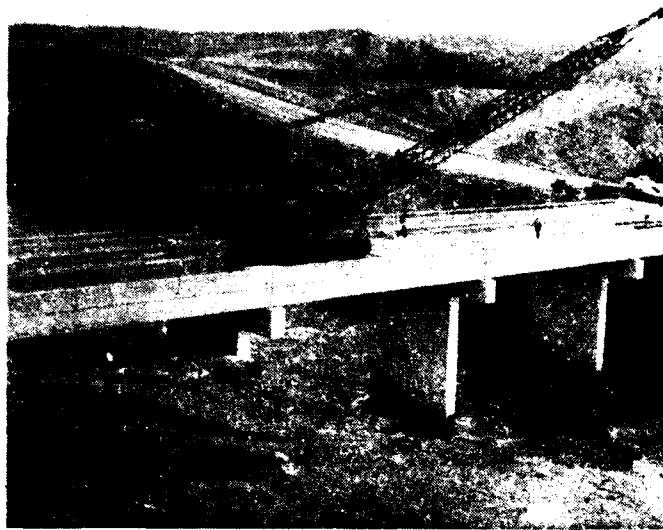


Photo 3 - Dravo crane crossing service bridge of diversion channel (July 1978)



Photo 4 - Looking east across diversion channel, along axis of dam (March 1978)



Fig. 6 - diversion channel excavation after second stage diversion, viewing south. (March 1982)



Photo 2 - diversion channel excavation after second stage diversion, viewing west. Note irregular slope of cut-off trench (left) dressed by grader (March 1980).

COFFERDIKE PHOTOS



Photo 8 - General view of cofferdike looking west
(October 1977)



Photo 9 - Cofferdike - slurry trench, looking west
showing fracture leading into trench
(November 1977)

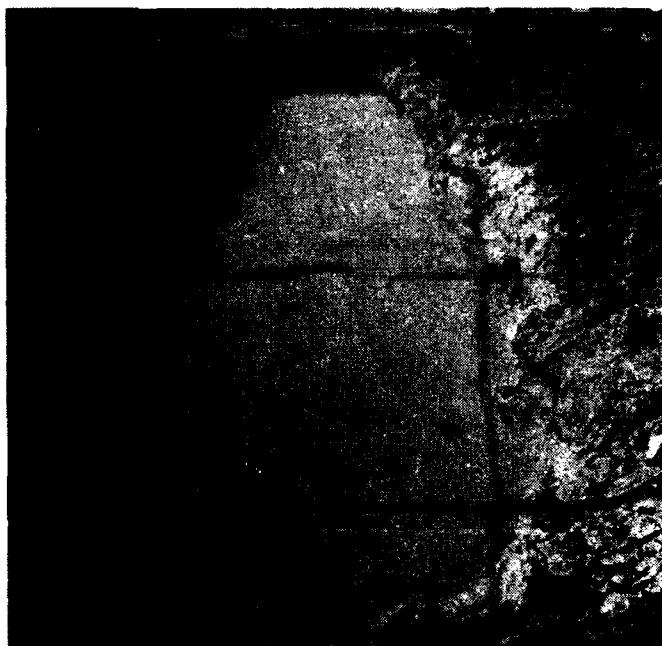


Photo 10 - Cofferdike - slurry trench excavation (October 1977)

EXCAVATION AND BLASTING PHOTOS



Photo 11 - Detonation of Blast Pattern 1001,
South Carolina abutment (January 1978)



Photo 12 - Blast Pattern 1007 after blast, looking
west (March 1978)

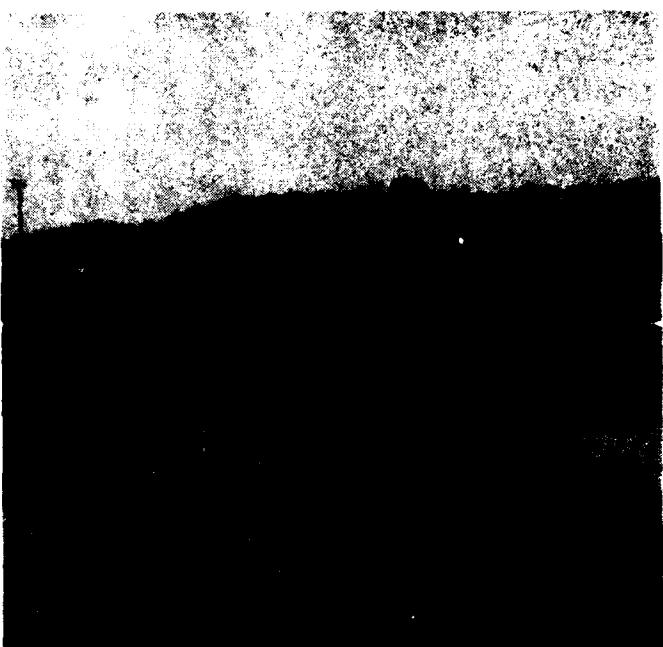


Photo 13 - View from near South Carolina tailrace wall. Blast Pattern 1242, Monoliths 13 and 14 about 360' right of centerline (June 1978)

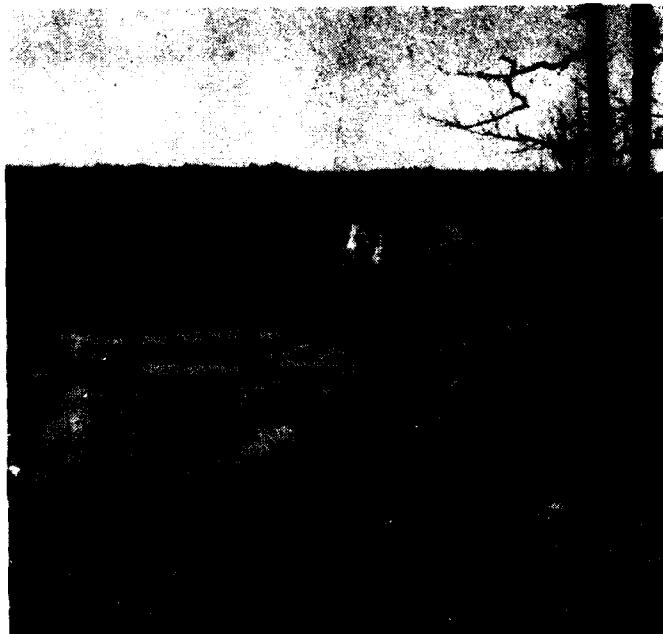


Photo 14 - Blast No. 112, Georgia abutment (March 1978)



Photo 15 - Tailrace Class 1 excavation standing at
station 30 + 00 looking east (April 1978)



Photo 16 - Blast Pattern 1021 detonation - South Carolina
abutment (April 1978)



Photo 17 - Mod "G" - Standing 800' downstream of
Station 27 + 00, looking northeast
(July 1978)



Photo 18 - Mod "G" - standing 800' downstream of
Station 27 + 00, looking north (July 1978)



Photo 19 - Looking west into west retaining wall foundation area - near horizontal wall seam is at El. 307 (September 1978)



Photo 20 - Standing in Monolith 16, looking west during excavation (September 1978)



Photo 21 - Clean-up in Monolith 30 after blasting,
looking west (September 1978)

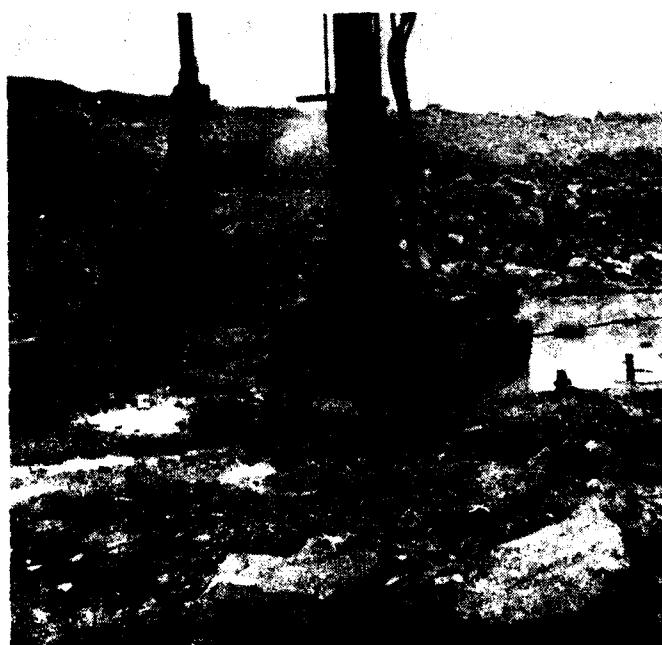


Photo 22 - Lane drillers on production shot downstream
of draft tubes. Foreman (Frank Poes) reported
difficulty with seam at about elevation 258'
(October 1978)

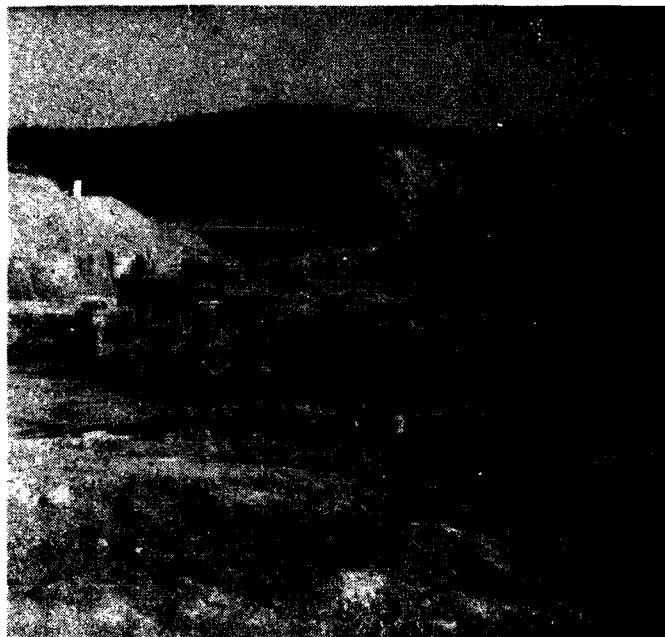


Photo 23 - Georgia abutment - Dravo cleanup crew in foreground,
Lane crew in background (October 1978)

CONCRETE DAM GENERAL PHOTOS

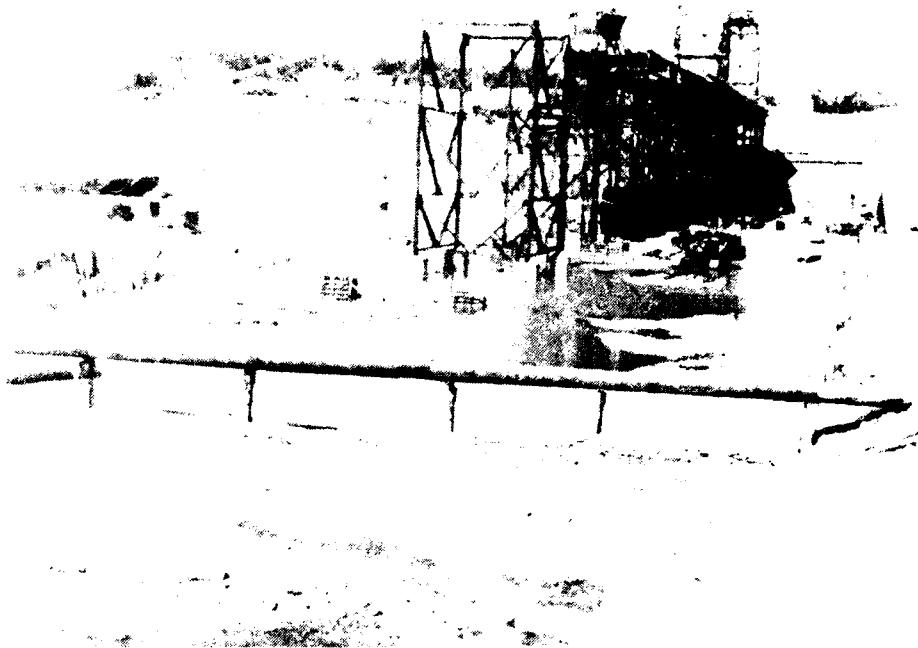


Photo 24 - Early dam construction - mod "I". Pipe in foreground carried upstream surface water to the devatering area downstream. (May 1979)

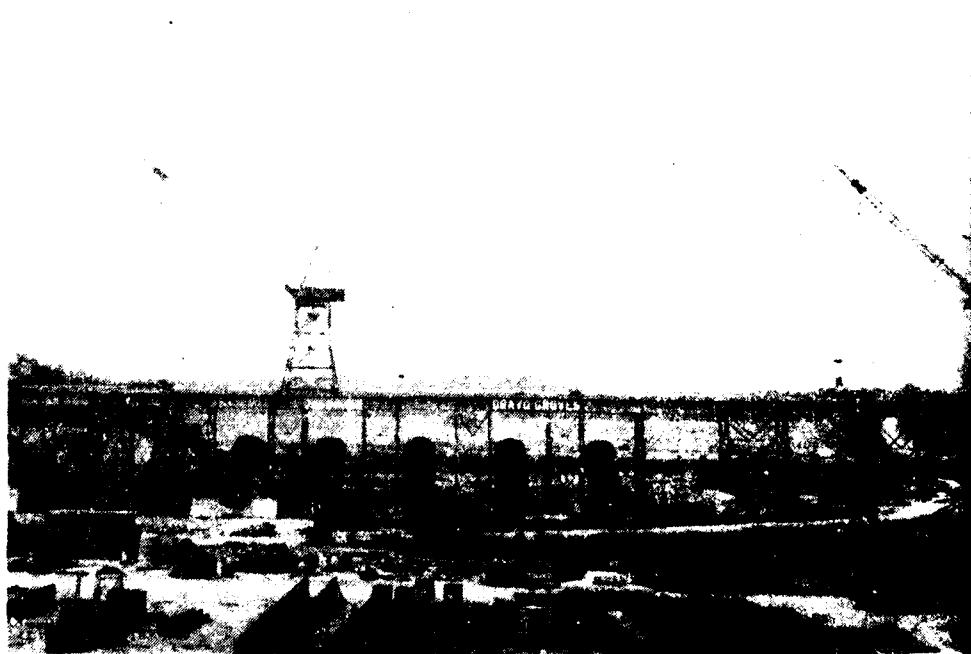


Photo 25 - Preparing to place concrete on monolith surfaces.



Photo 26 - First bucket of concrete - Monolith 2

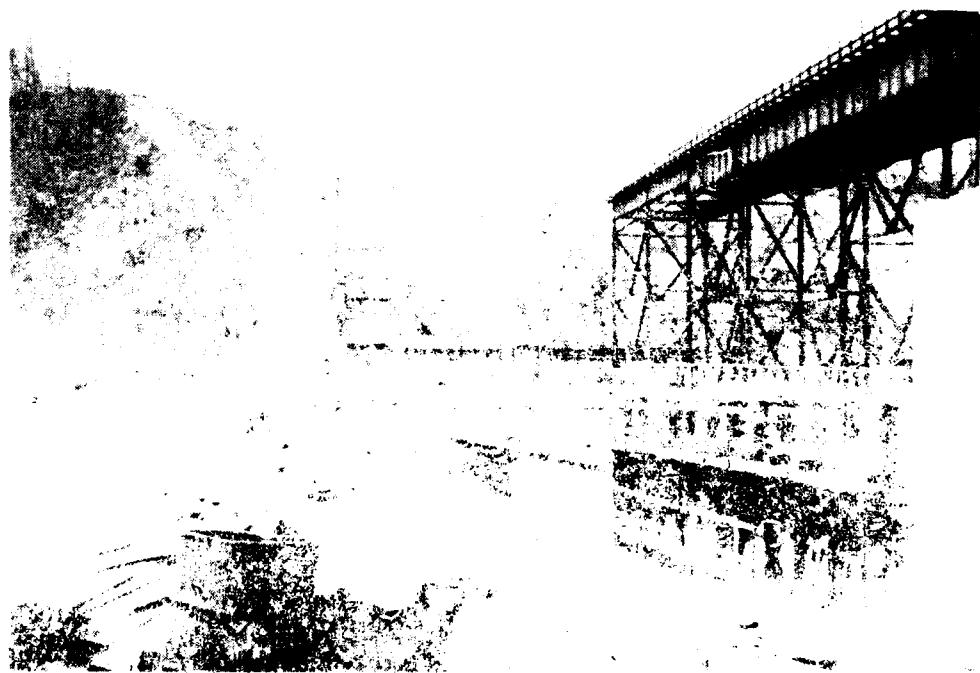


Photo 27 - Monolith 2 - The first concrete pour of the second monolith. The monolith is 100' high and 100' wide. It is built on a tall, multi-tiered metal framework.

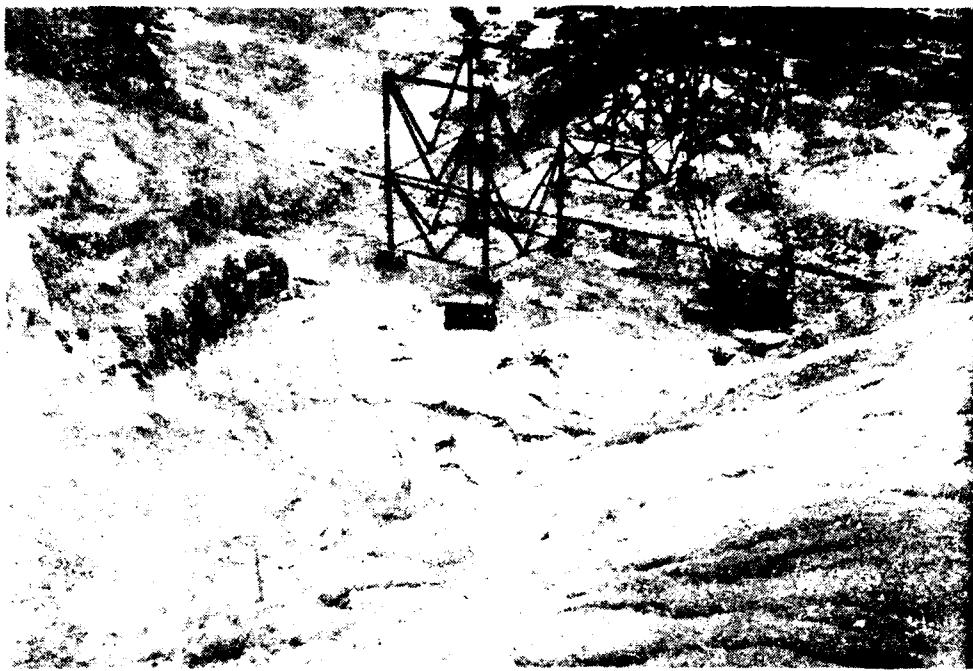


Plate 28 - View of excavated Monoliths 27, 26, and 25 from the upstream side of Monolith 30. Note EHC dikes and faulting, and trestle construction, top center (August 1979)





Photo 30 - View looking west from South Carolina embankment Block 32



Photo 31 - Monolith construction - view from upstream
South Carolina abutment - non-overflow block
in foreground (October 1980)



Photo 32 - Spillway training wall - note vertical crack line non-overflow "monoliths 26 and 27, right side of photo.

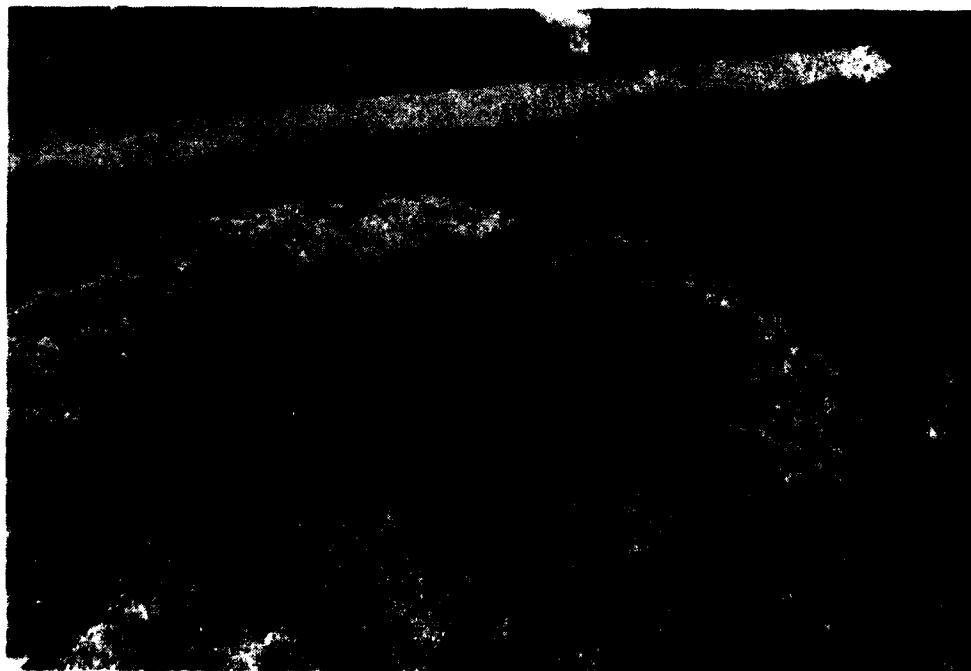


Photo 33 - Installation of plumb bob pipe, Block 16 (December 1979)



Photo 34 - Sumps - Monolith 16 (September 1979)



Photo 35 - Leak in leaching pipe - Monolithic - Cleverton - 1979

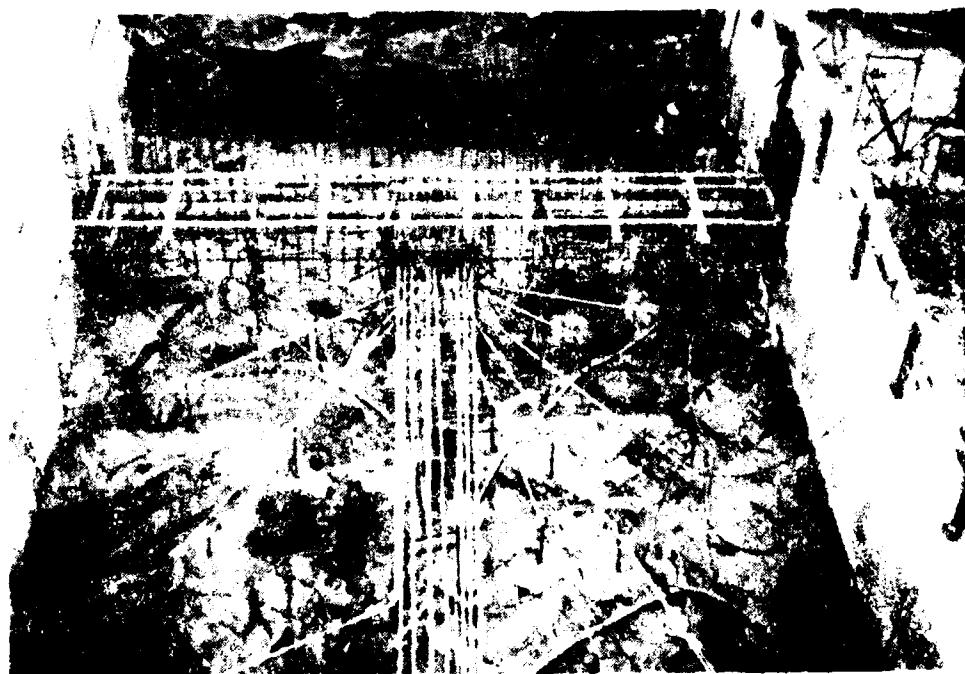


Photo 36 - Filter cell installation, Block 2 - Cleverton - 1980

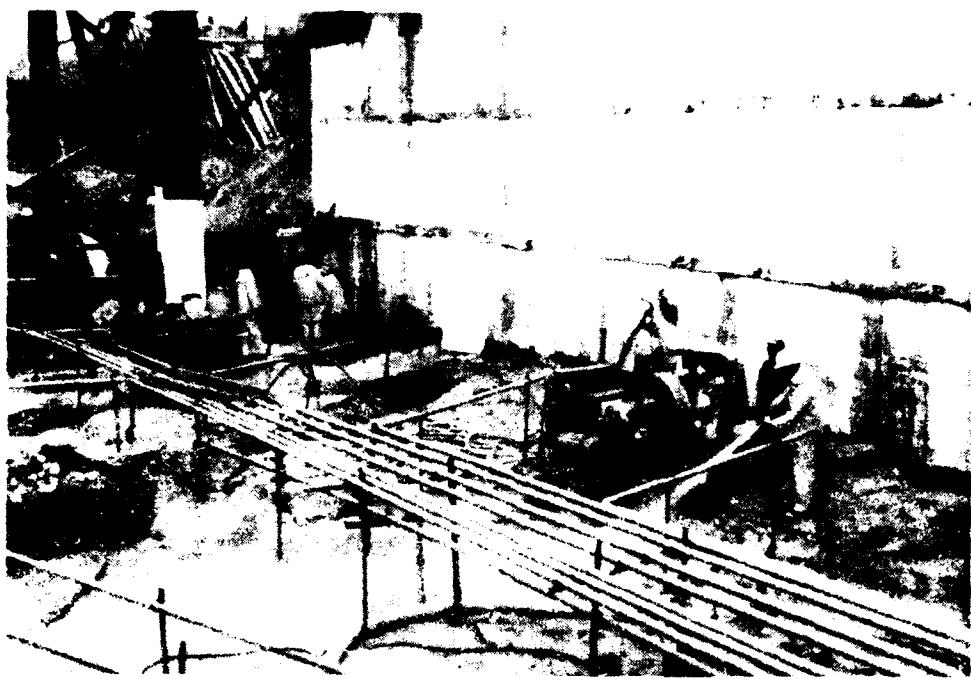


Fig. 17 - "Pluff cell" installation, Block 2, January 1980.

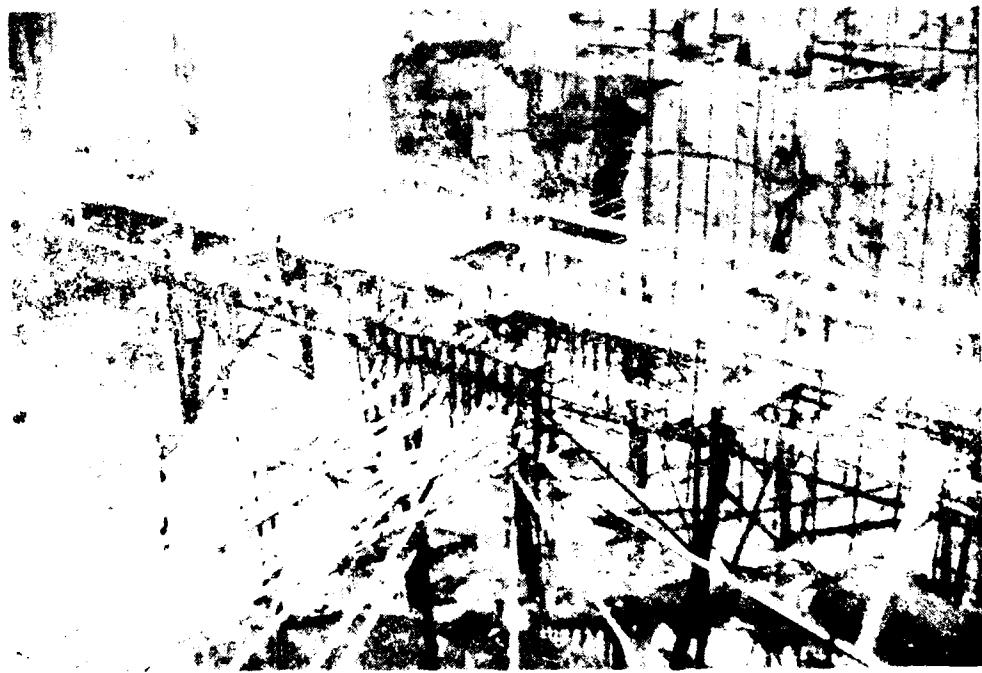


Fig. 18 - "Pluff cell" installation, Block 2, January 1980. The framework, which is suspended from the main structure parallel to the insulation, is oriented with the reactor sleeves. (February 1980)

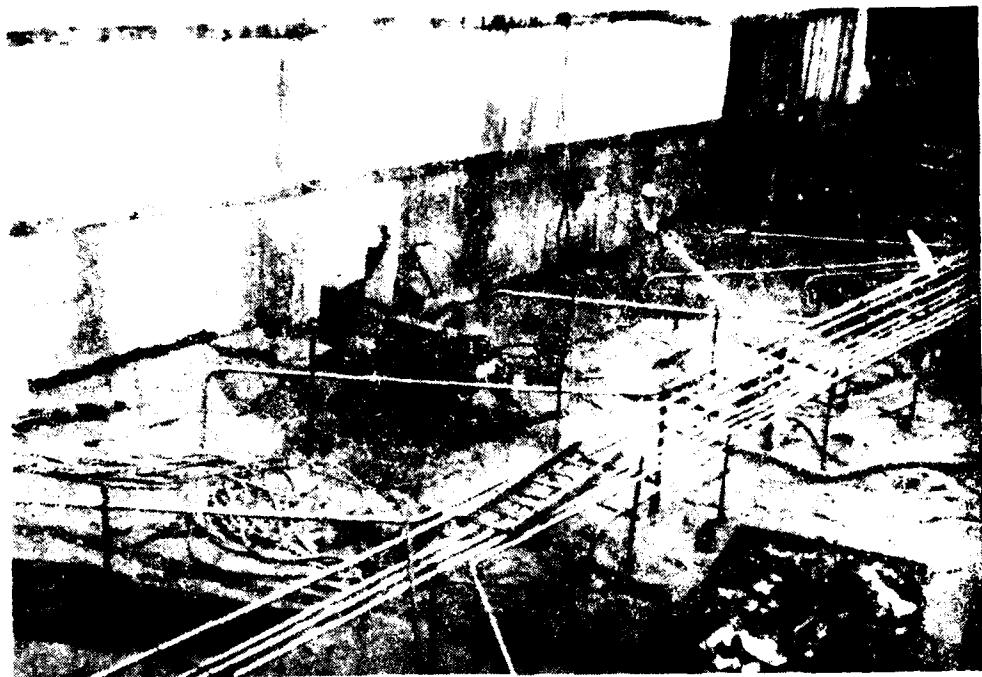


Photo 39 - Finalizing uplift cell installation, Block 7
(January 1980)

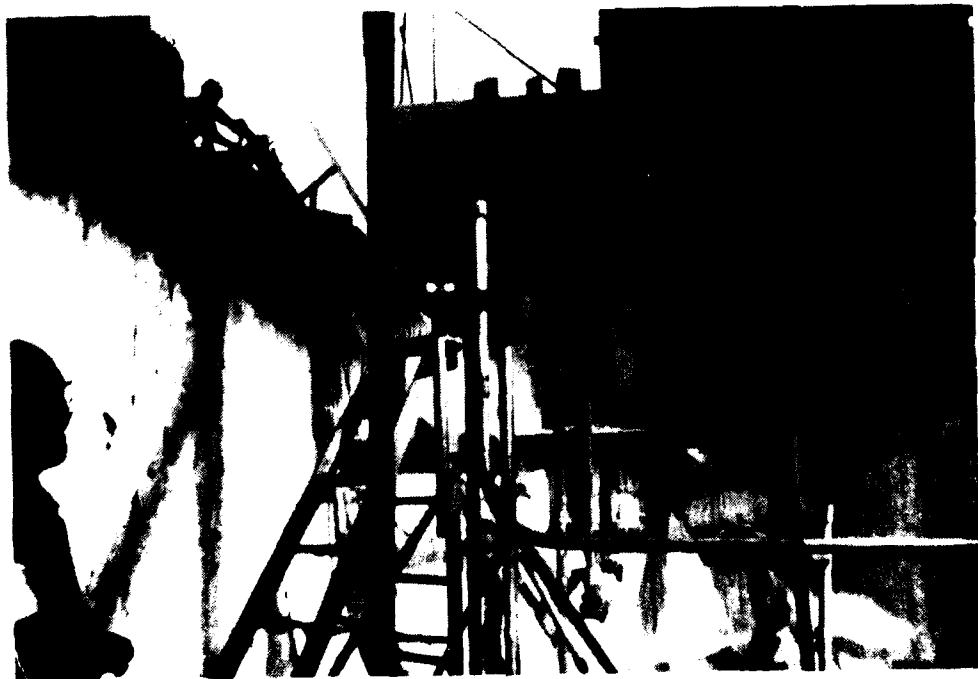


Photo 40 - Uplift cell installation, Block 10 - note future
read out-box, center (November 1979)

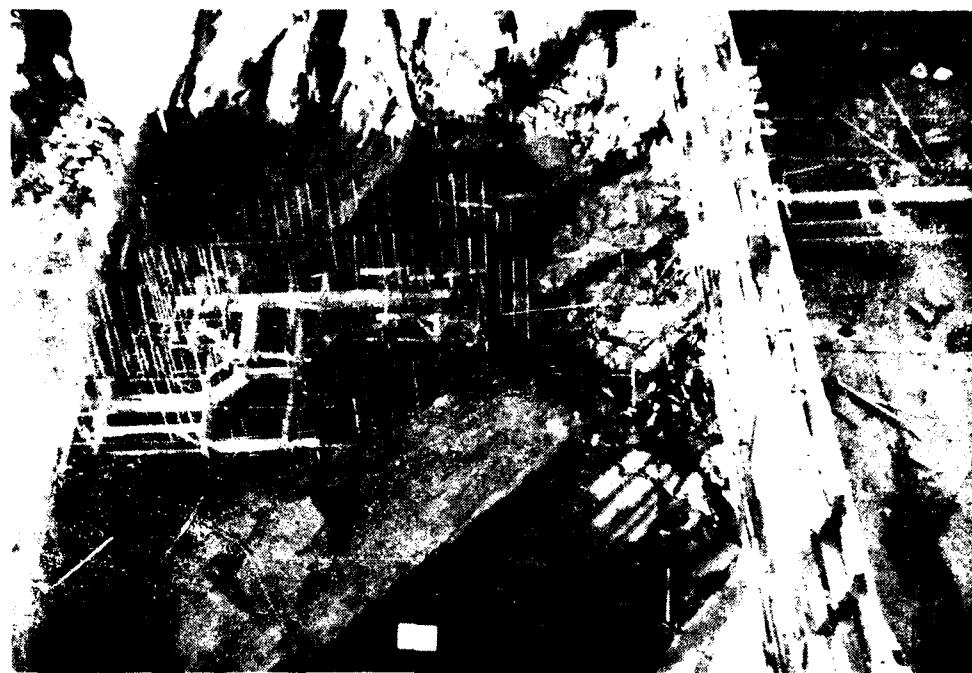


Photo 41 - Forming inspection gallery for Monolith 27. Note uplift cells in Block 28, upper right. (January 1980)

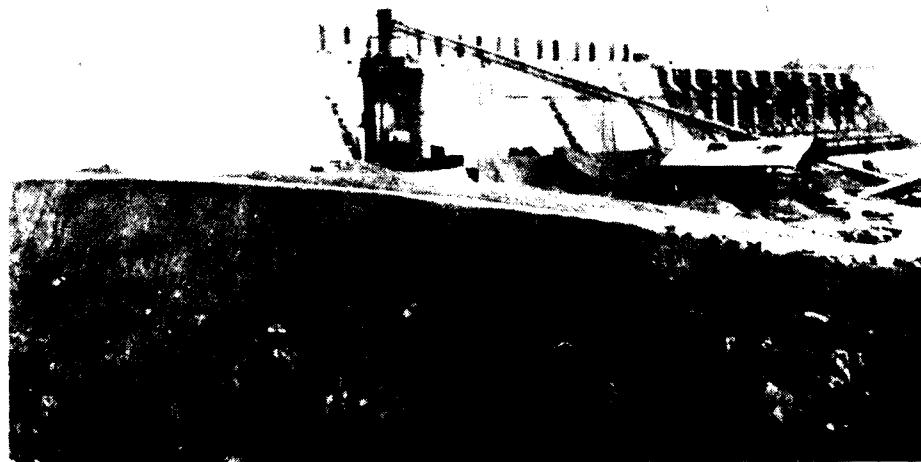


Photo 42 - Downstream side of dam after second stage diversion. (February 1982)



Photo 43 - Downstream side of dam after second stage diversion.
(February 1982)

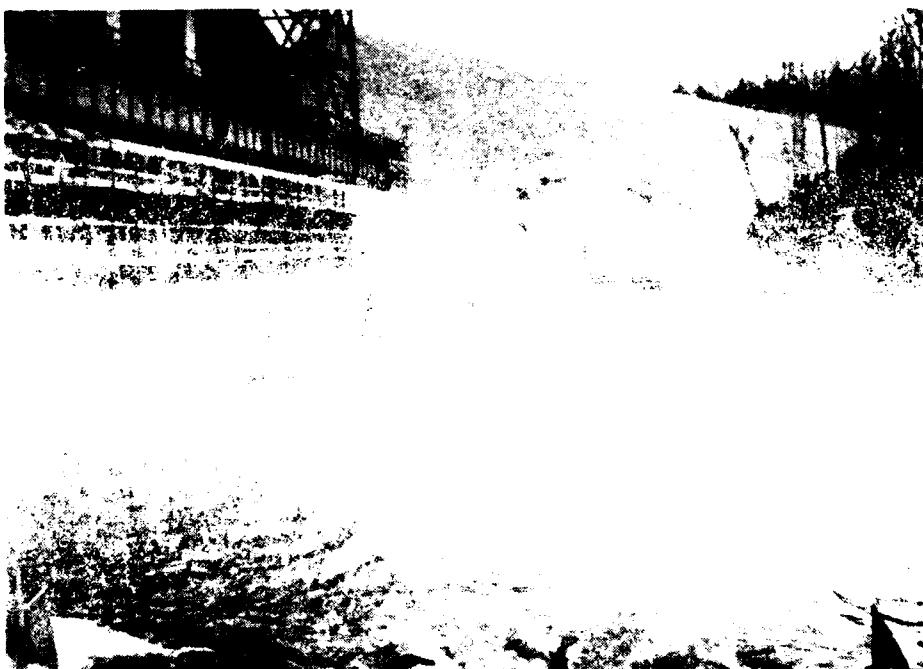


Photo 44 - Downstream side of dam after second stage diversion.
(February 1982)

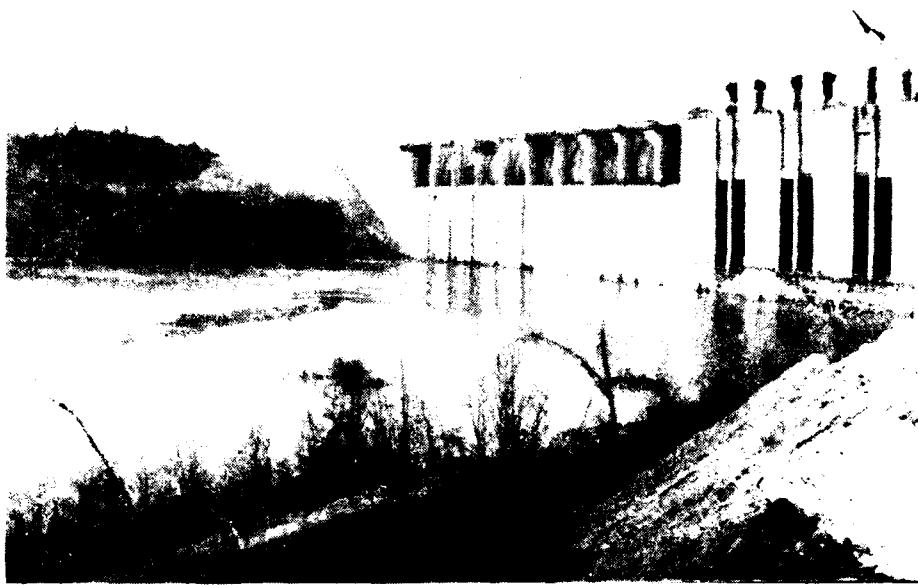


Photo 45 - Upstream side of dam shortly after second stage diversion (January 1982)

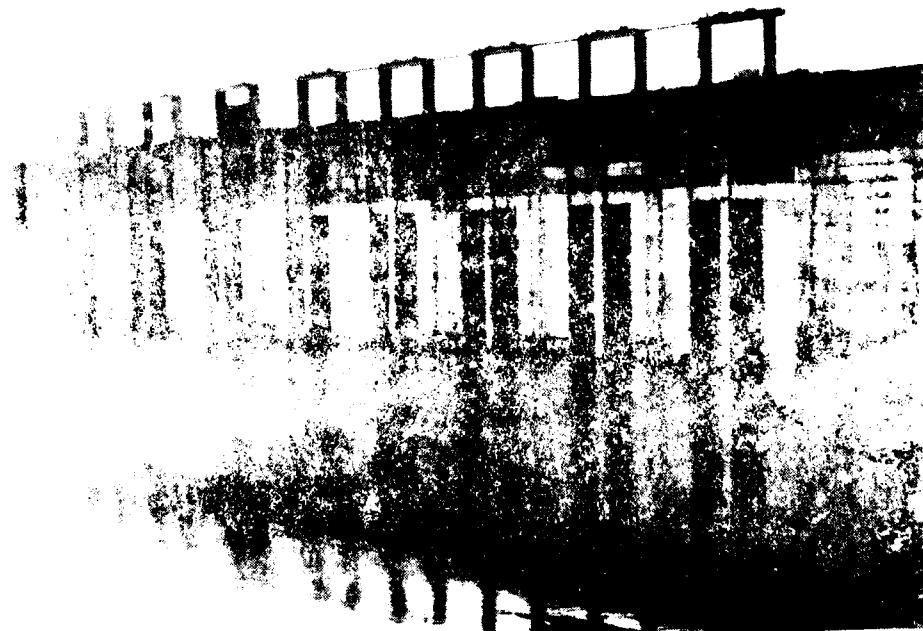


Photo 46 - Upstream side of dam (February 1982)

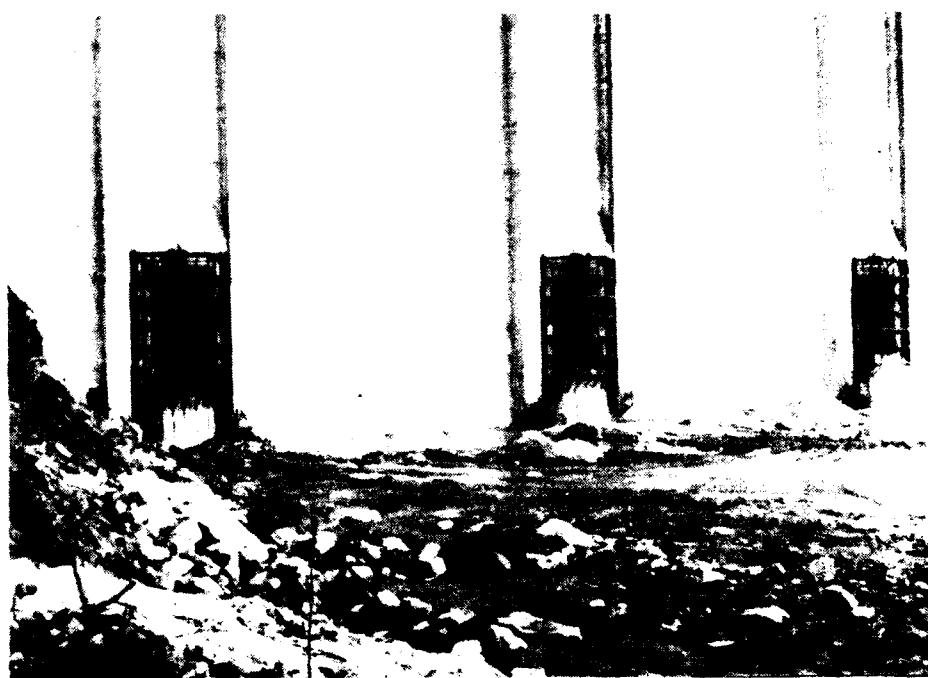


Photo 47 - Upstream side of dam - sluice entrances with stop log

CONCRETE DAM FOUNDATION PHOTOS



Photo 48 - Monolith 1 foundation (June 1979)

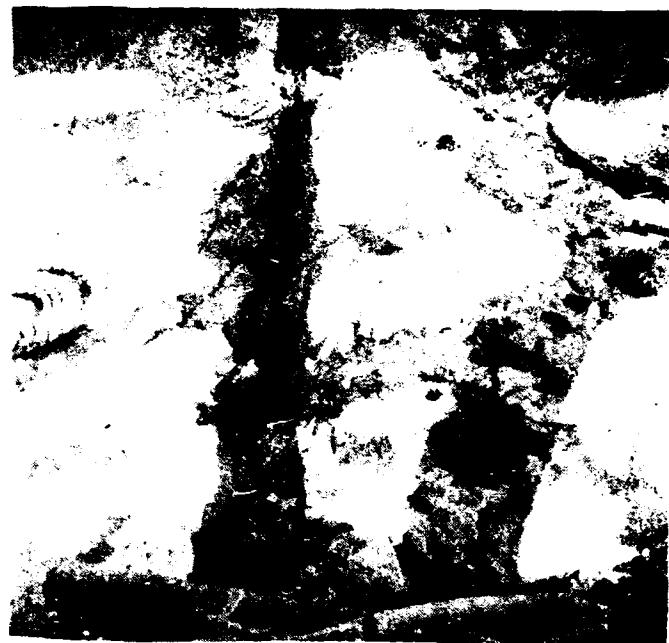


Photo 49 - Monolith 2 foundation - dike running downstream under trestle toward upstream of Monolith 2 (April 1979)



Photo 50 - Monolith 2 foundation stress zone (April 1979)



Photo 51 - Monolith 3 foundation (May 1979)



Photo 52 - Monolith 3 foundation (May 1979)

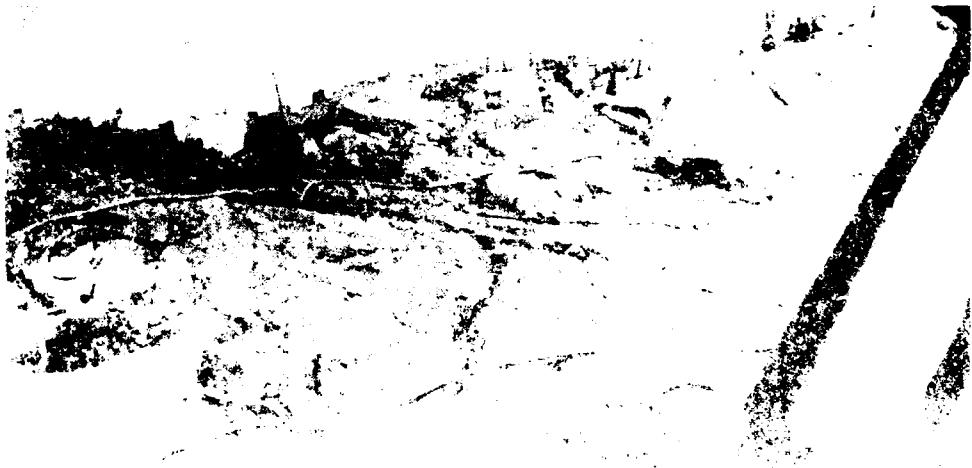




Photo 55 - Monolith 6 foundation. (May 1979)



Photo 56 - A fragment of a lithic clast that contains rounded cobbles of felsic rock. At least one of these cobbles had an apparent bedded structure which had survived contact metamorphism and recrystallization. (March 1979)



Photo 57 - Monolith 7 foundation (December 1979)



Photo 58 - Monolith 7 foundation (December 1979)



Photo 59 - Monoliths 7 and 8 step-up face. Iron pipes are grout and drain guide sleeves. Lengths vary to provide 2"-6" of stickup into gutters in the rising galleries. (July 1979)



Photo 60 - Monoliths 7 and 8 step-up face (August 1979)



Photo 61 - Monolith 8 Foundation (August 1979)



Photo 62 - Monolith 8 foundation (May 1979)



Photo 63 - Monolith 10 foundation (December 1979)



Photo 64 - Monolith 10 foundation (October 1979)





Photo 66 - Menolith 11 foundation (July 1970)





Fig. 1. - Hillside in the first-order drainage basin of the Arroyo del Cerro, 1970.



Fig. 2. - Hillside in the first-order drainage basin of the Arroyo del Cerro, 1970.

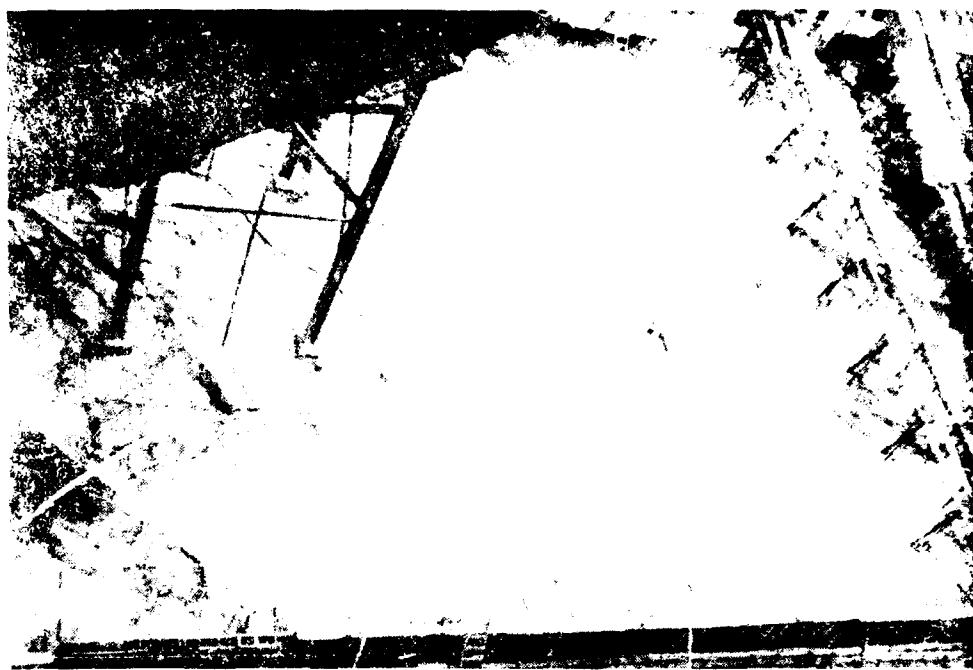


Photo 40. Monolithic 13 Foundation, fault is prominent near middle of photo (January 1980)



Photo 41. Monolithic 13 Foundation fault (January 1980)



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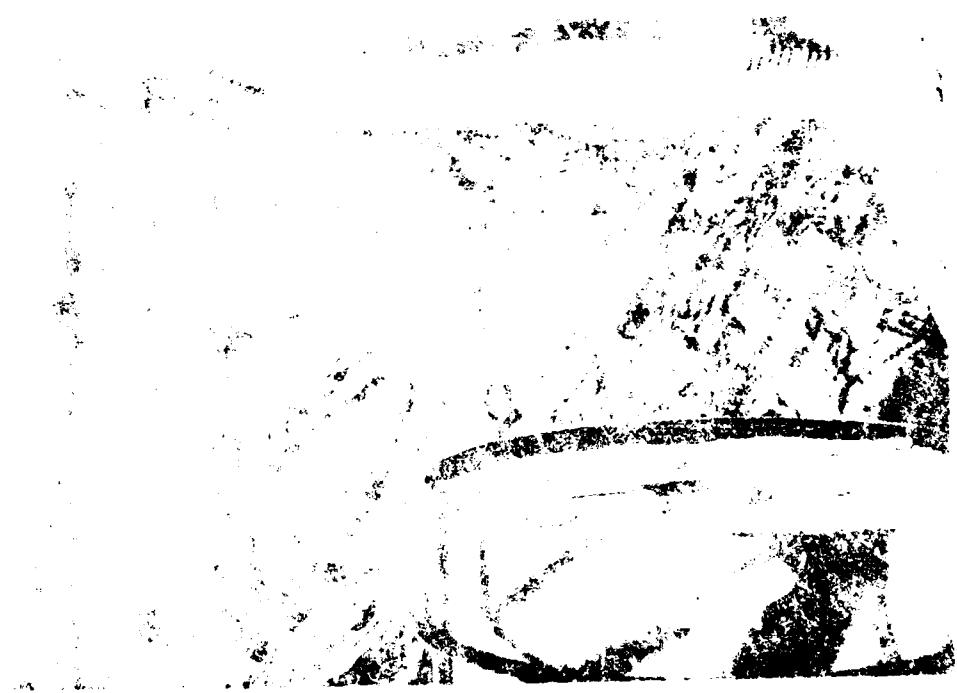




FIGURE 25. - MOUNTAIN IN THE MOUNTAINOUS AREA.



FIGURE 26. - MOUNTAIN IN THE MOUNTAINOUS AREA.
NOTE THE DARK, PROMINENT, DARK, RECTANGULAR STRUCTURE.

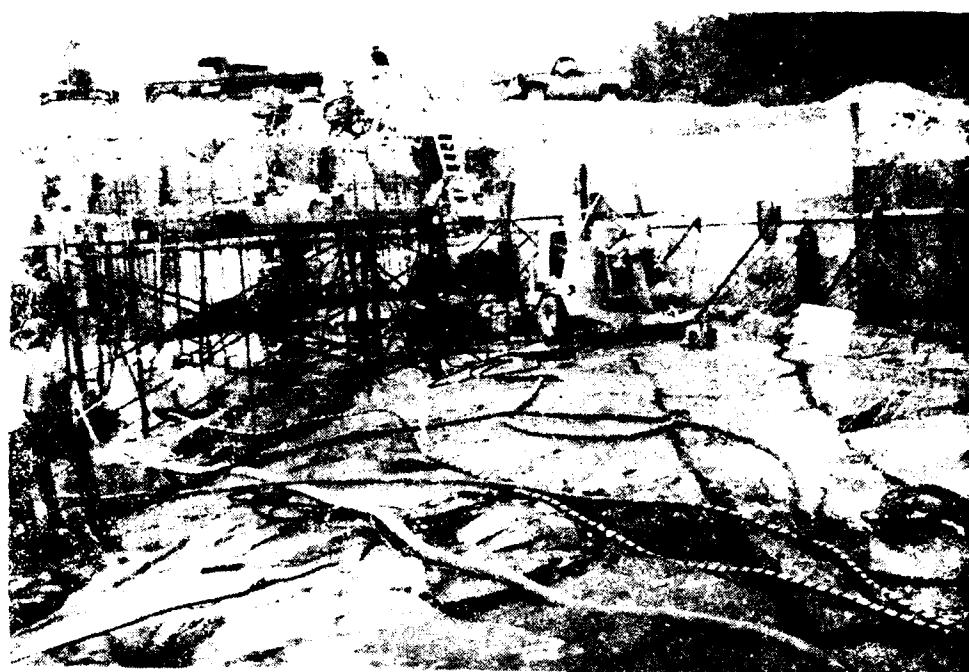


Photo 77 - Menolith 19 foundation (August 1979)



Photo 78 - Menolith 19 foundation (August 1979)

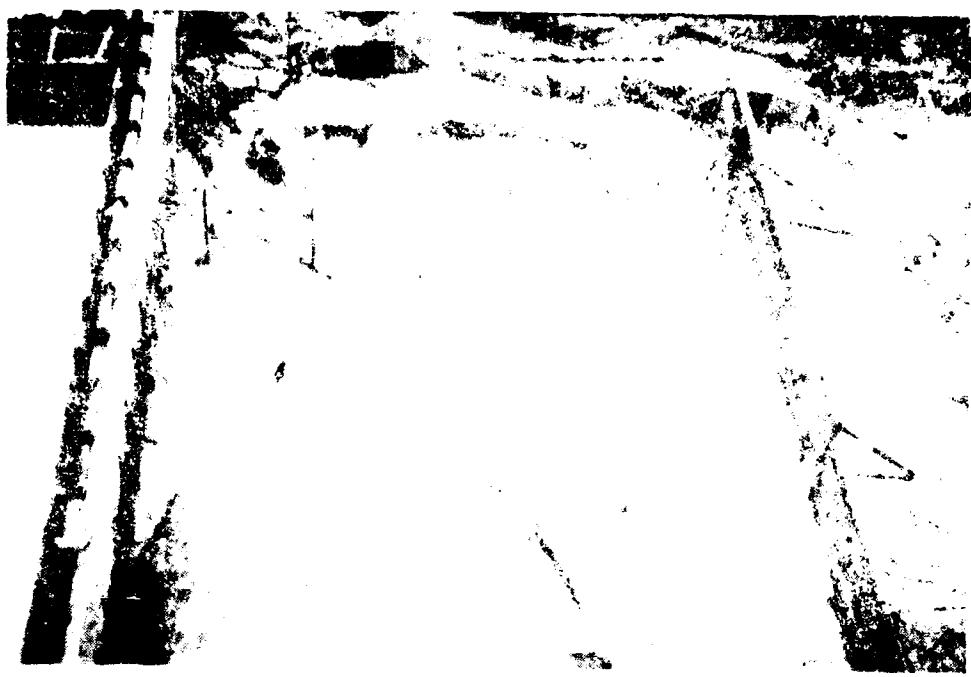






Photo 83 - Monolith 22 foundation (December 1979)

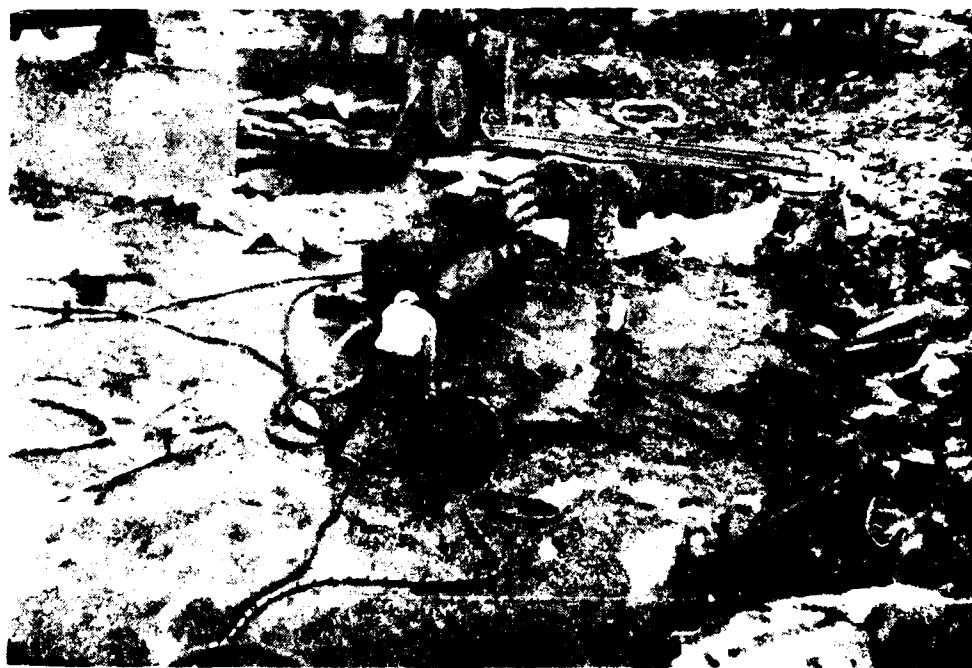


Photo 84 - Monolith 23 foundation grouting (November 1979)



Photo 85 - Monolith 23 foundation (February 1980)



Photo 86 - Monolith 23 foundation (April 1980)

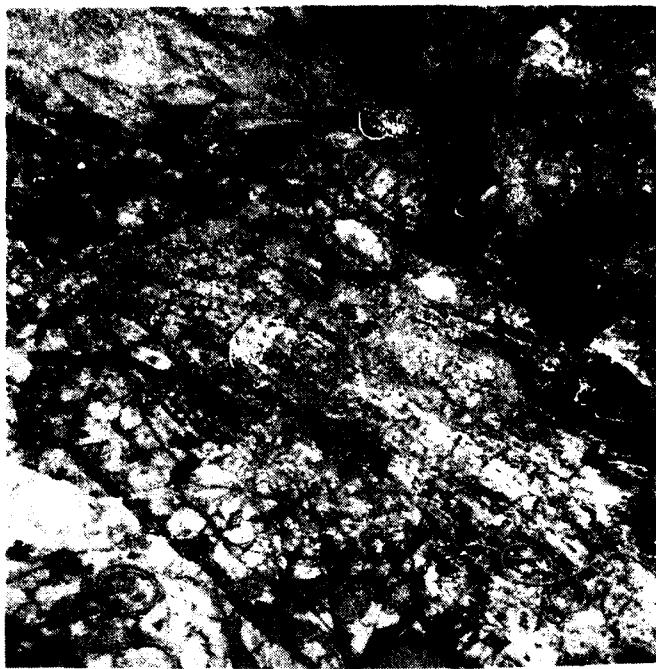


Photo 87 - Monolith 26 foundation (September 1979)



Photo 88 - Monolith 26 - Installation of rebar basket on footer foundation (September 1979)



Photo 89 - Monolith 27 foundation (January 1980)



Photo 89 - Monolith 27 foundation (January 1980)

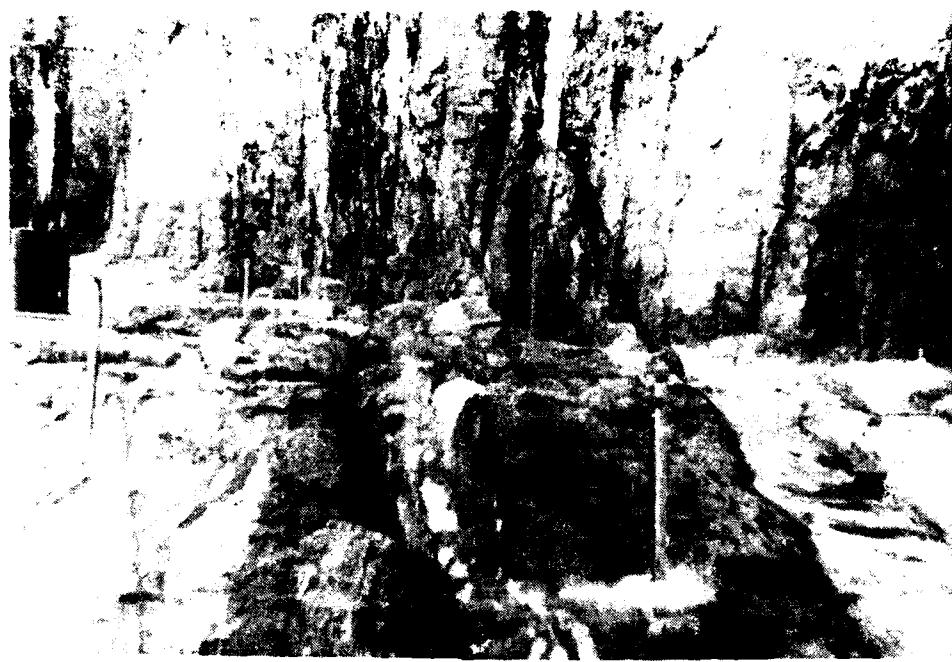


Photo 91 - Non-liths 28/29 foundation (November 1970)



Photo 92 - Non-liths 28/29 Step-up face (March 1980)



Photo 93 - Monoliths 28/29 Step-up face (February 1980)



Photo 94 - Monolith 29 foundation



Fig. 1. A large block of stone, 1.5 m. high, foundation of a small structure, Chavín de Huántar, Peru (July 1980).



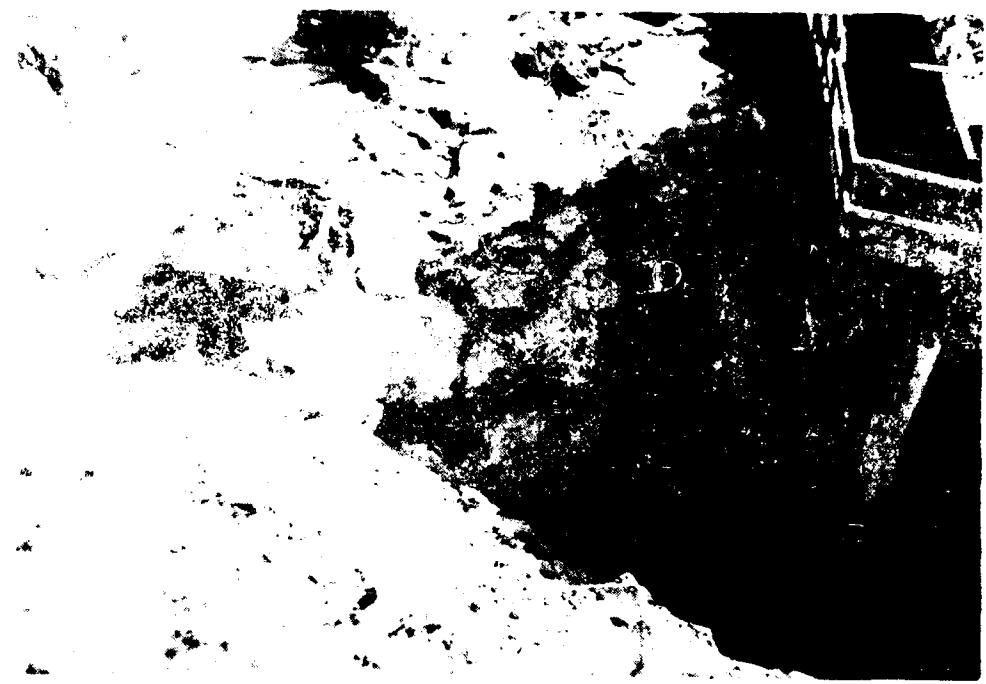


Plate 97 - Monolith M foundation (October 1980)

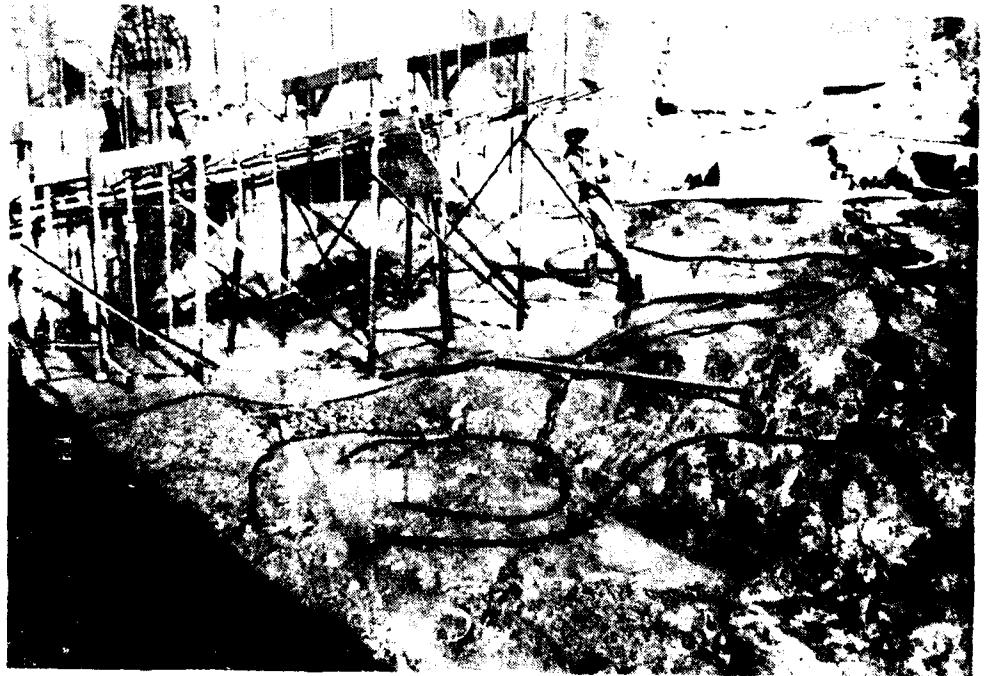


Plate 98 - Monolith M foundation (October 1980)



Photo 99 - Monolith 32 foundation - looking east (February 1981)

GROUTING INSIDE GALLERY



Photo 191 - Chicago pneumatic CP-65 drilling grout hole.
(October 1981)

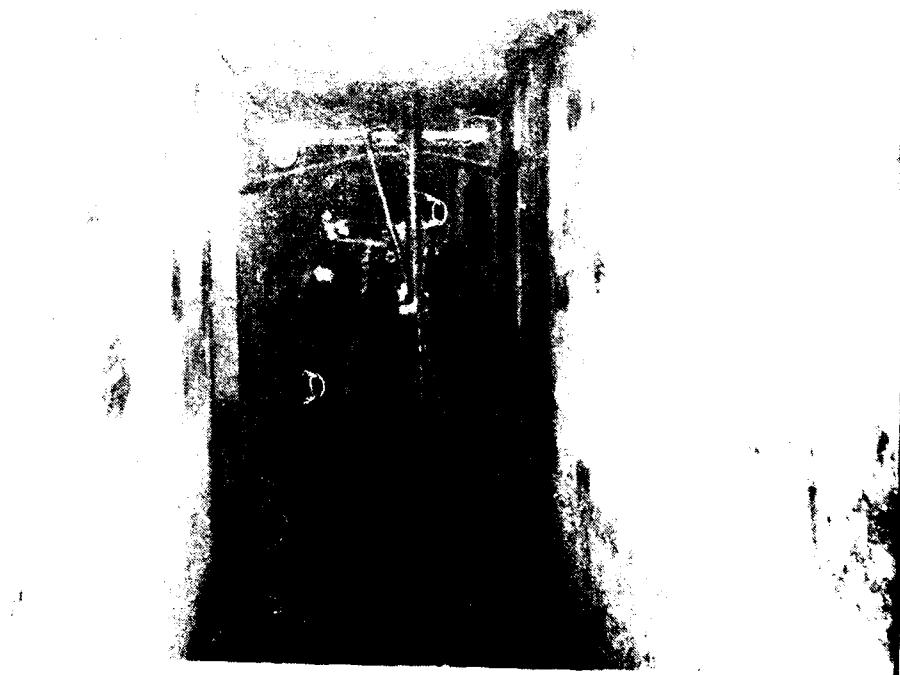


Photo 191 - Chicago pneumatic CP-65 drilling grout hole.
(October 1981)

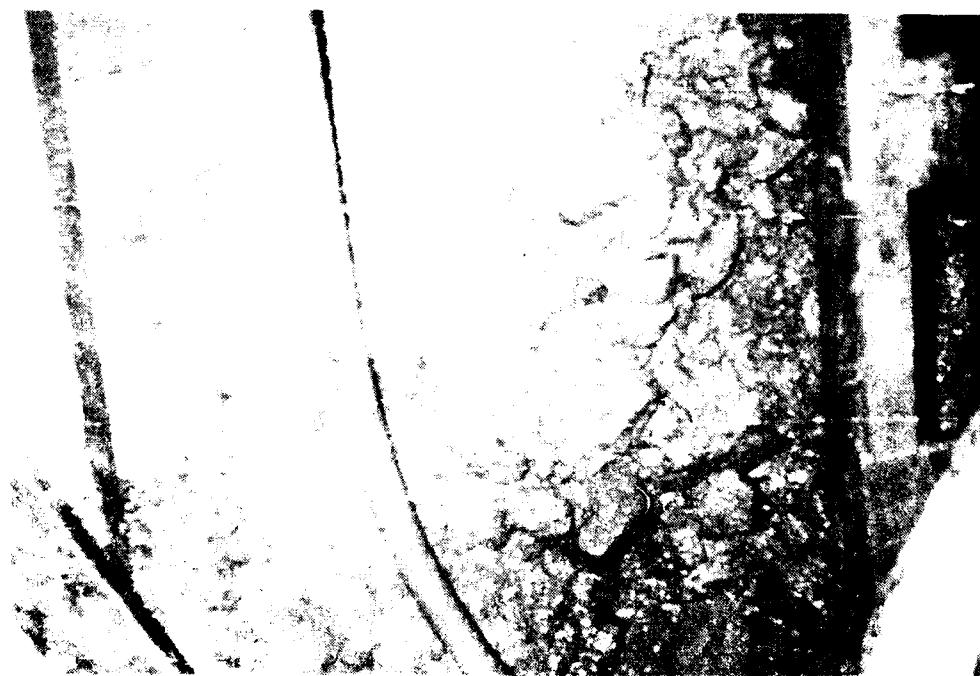


Figure 1. A high-contrast, black and white photograph of a dark, textured surface, possibly a wall or door, with a small, dark, irregular hole or tear near the top right corner.





Block 104 - Block 27 gallery floor, great communication with
hole at Station 16 + 91 (August 1981)



Block 104 - Block 27 gallery floor, great communication with
hole at Station 16 + 91 (August 1981)

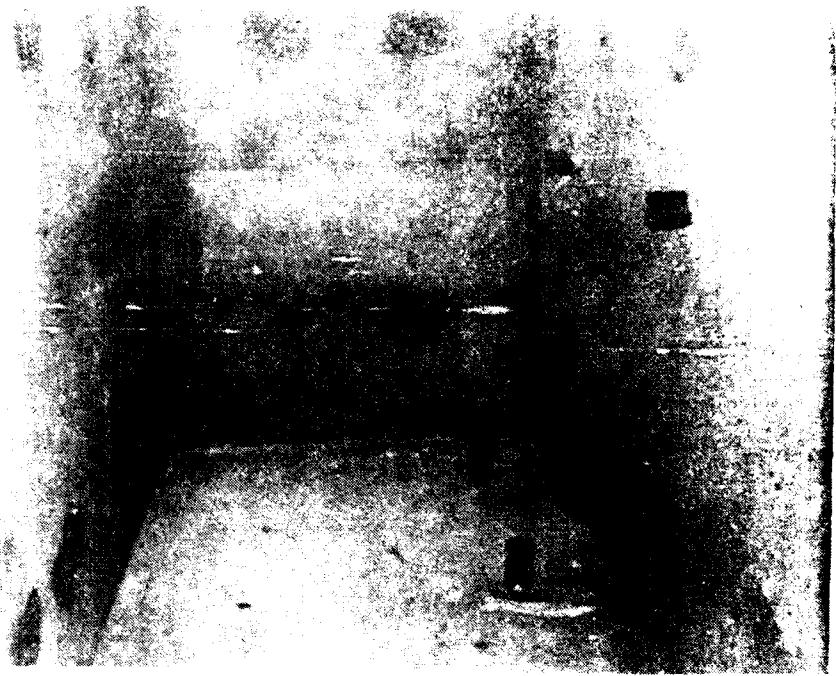


Photo 106 - Inspection gallery grouting - Block 15 "tee" point, 100' N. of
the "T" junction, 100' E. of the "T" junction, 100' E. of the "T" junction



Photo 107 - Inspection gallery grouting - Block 15 (August 1981)

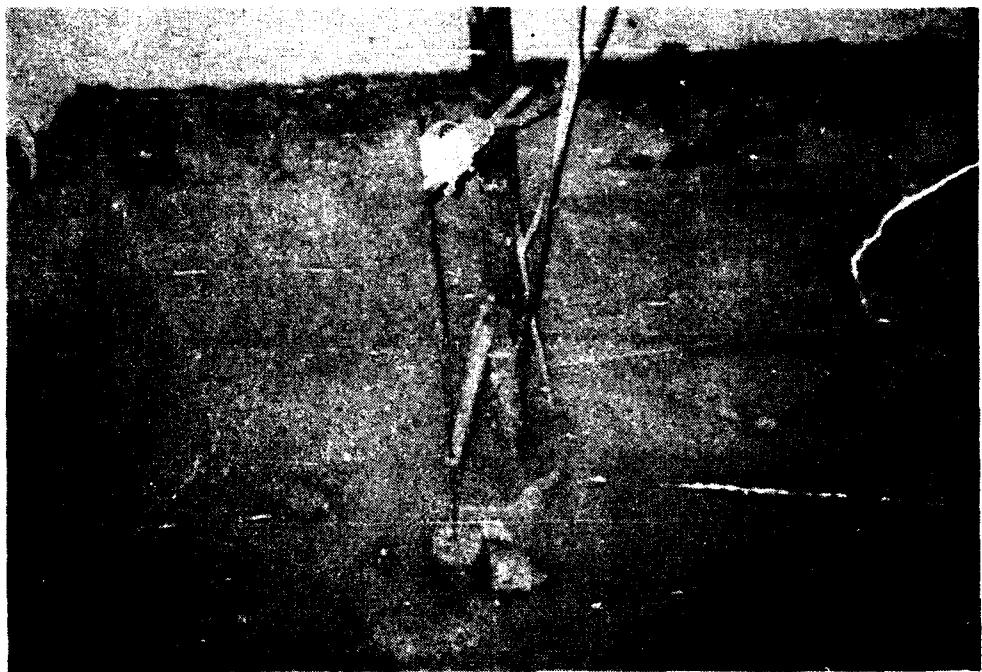


Photo 108 - Sump pump with automatic float devices (October 1981)

POWERHOUSE PHOTOS



Photo 109 - Power excavation (May 1979)



Photo 110 - Powerhouse excavation - note "noses", drainage sump (filled with water) and draft tube tailrace slope 1 on 5. (February 1980)



Photo 111 - Powerhouse excavation - erection bay area and
Unit #1. (February 1980)



Photo 112 - South wall, erection bay looking east (1980)



Figure 143 - Powerhouse excavation (May 1981)





Photo 115 - Powerhouse excavation (May 1981)



Photo 116 - Powerhouse excavation (May 1981)



Figure 11. - A steep cut in the hillside, the result of a major slide. The present cut is the second one, the first having been removed by the overflows from the Lake Union dam, Seattle, Washington, in 1911 and 1912. (See p. 109.)

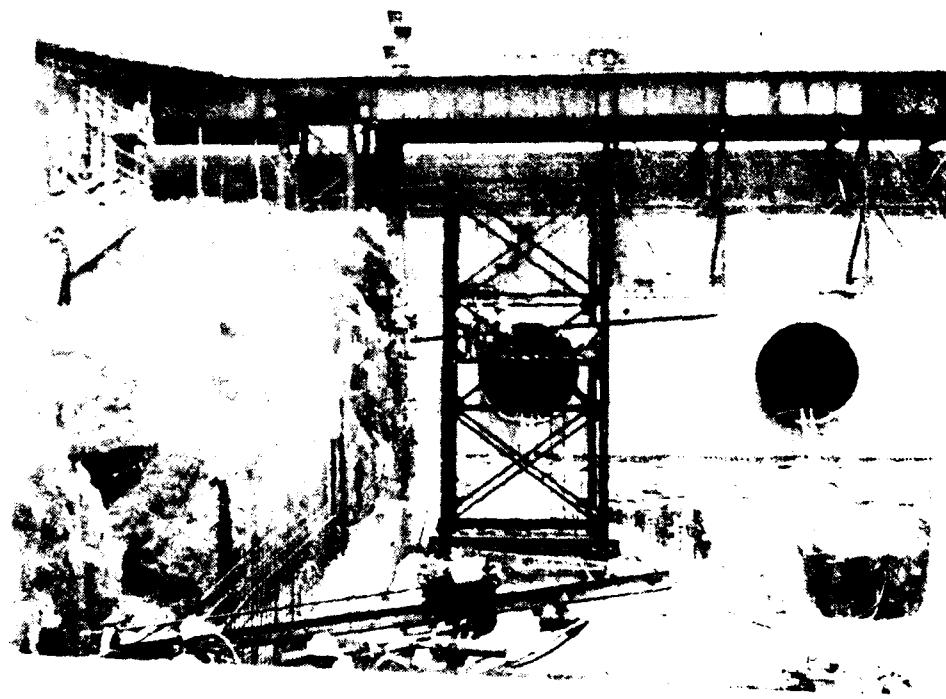


Figure 12. - A large concrete dam at Lake Union, Seattle.



Photo 119 - Powerhouse excavation - viewing west. Note tailrace hang-on wall and erection bay substructure in top left quadrant of photo. (October 1981)



Photo 120 - Powerhouse excavation - viewing east (April 1981)



Photo 121 - Powerhouse excavation, taken immediately after

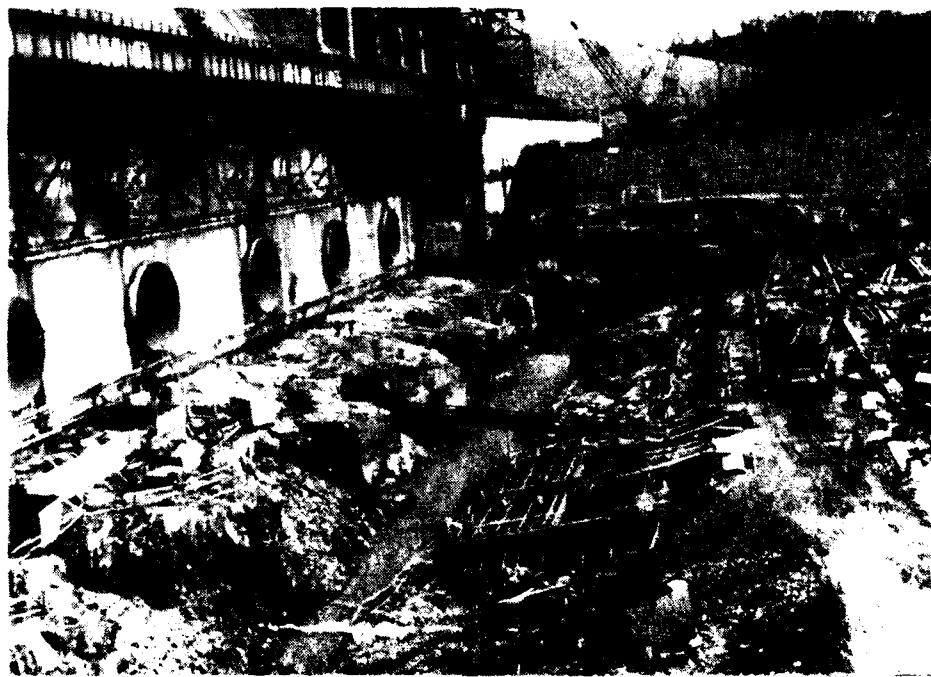


Photo 122 - View of the destroyed or excavated area, showing the long structure in the background.

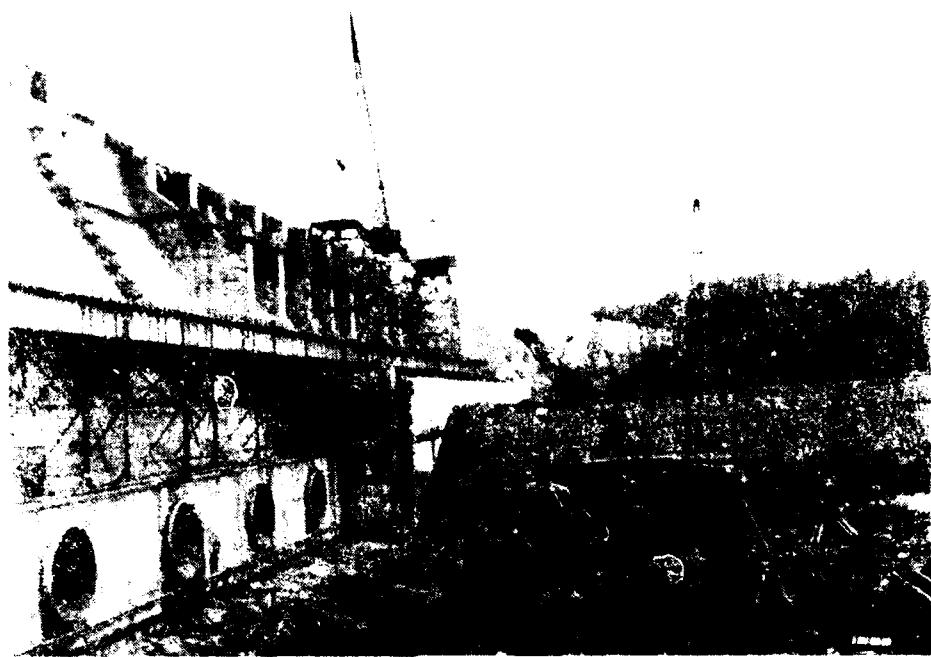


Photo 123 - Powerhouse area - immediately after second stage diversion. (January 1982)



Photo 124 - A view of the surface "mud" (January 1982)

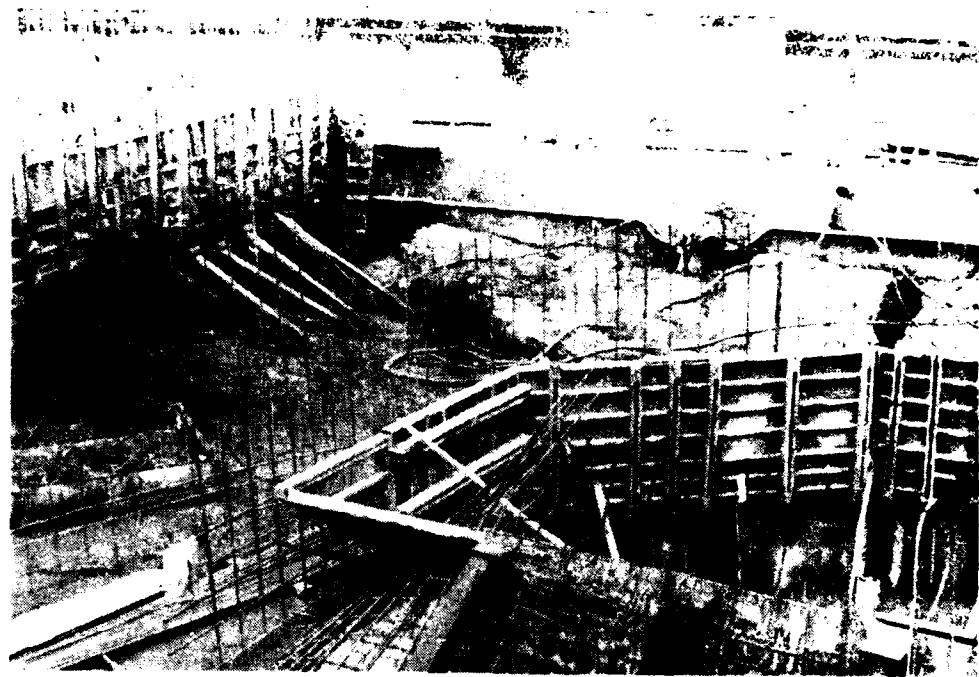


Photo 125 - Powerhouse Unit #2 (1982)

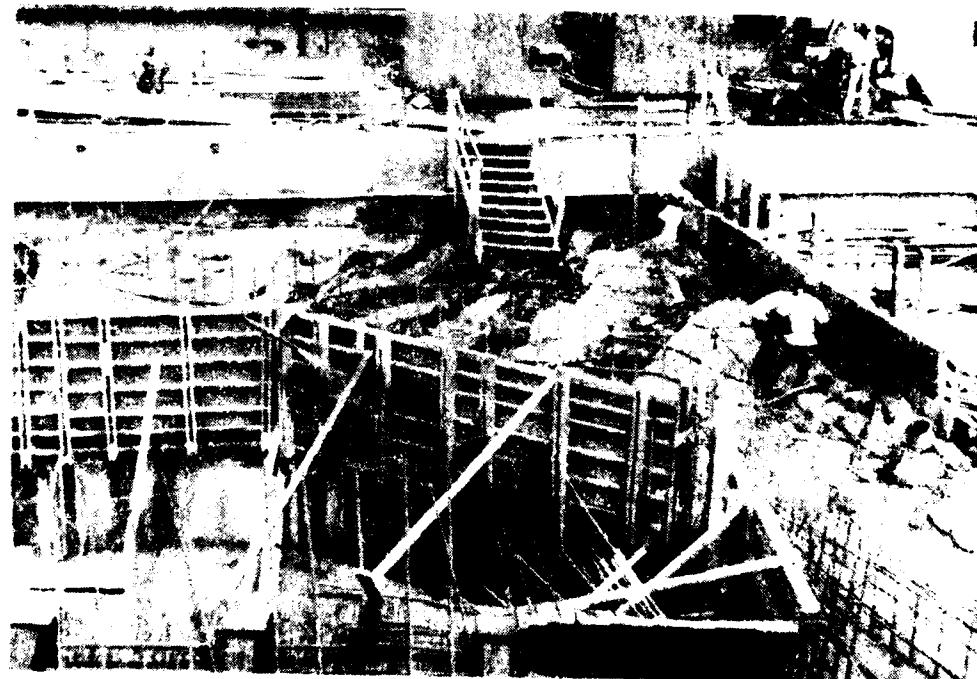


Photo 126 - Powerhouse Unit #2 (1982)



Photo 127 - Powerhouse foundation - vicinity of Unit #2 (1982)

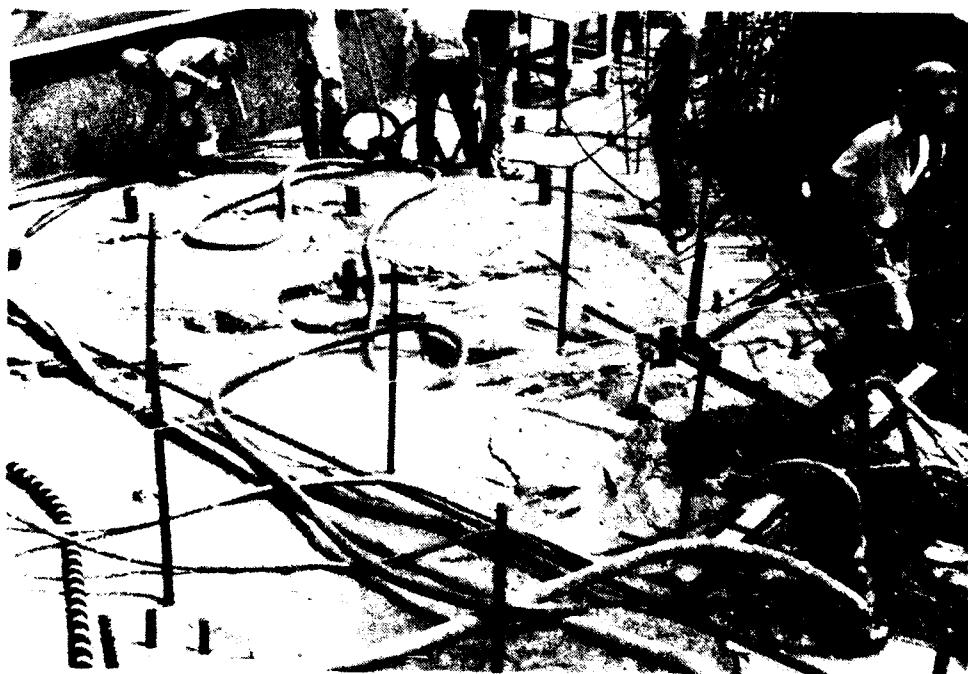


Photo 128 - Powerhouse foundation - vicinity of Unit #2 (1982)



Photo 129 - Drilling foundation relief drains - draft tube area.(1982)

GEORGIA WEST EMBANKMENT PHOTOS



Fig. 1. - A steep, rocky hillside near Lake Elsinore, California.



Fig. 2. - A steep, rocky hillside near Lake Elsinore, California.



FIGURE 132. - PROBABLY THE CEREMONY OF THE ANNUAL REINFORCEMENT OF THE BOUNDARY.



FIGURE 133. - PROBABLY THE COASTAL PLATEAU OF THE BOUNDARY.



Photo 134 - Pressure washing with communication. These pipes extend 20-40 feet down through overburden and the communication is probably at the overburden/rock contact. (February 1980)



Photo 135 - Communication off-tracker during Class 3 excavation. (December 1979)



Photo 136 - Foundation conditions, Georgia west - approximately Stations 9+00 to 10+00. Some additional excavation was done in this area.



Photo 10 - Pollution conditions - stations 9-100 to 100-1000



Photo 11 - Pollution for west embankment (left) - 1000



Photo 139 - Mixing grout in Georgia west grout area (February 1980)



Photo 140 - Georgia west excavation - approaching diversion channel foreground (April 1980)



Photo 141 - Cross-dike treatment at Station 7+85.



Photo 142 - Crout leaks at Station 12+10. Note gray streaks in center of photo where thin grout ran over the stairsteps.



Photo 143 - Foundation - on it in - on the west embankment.



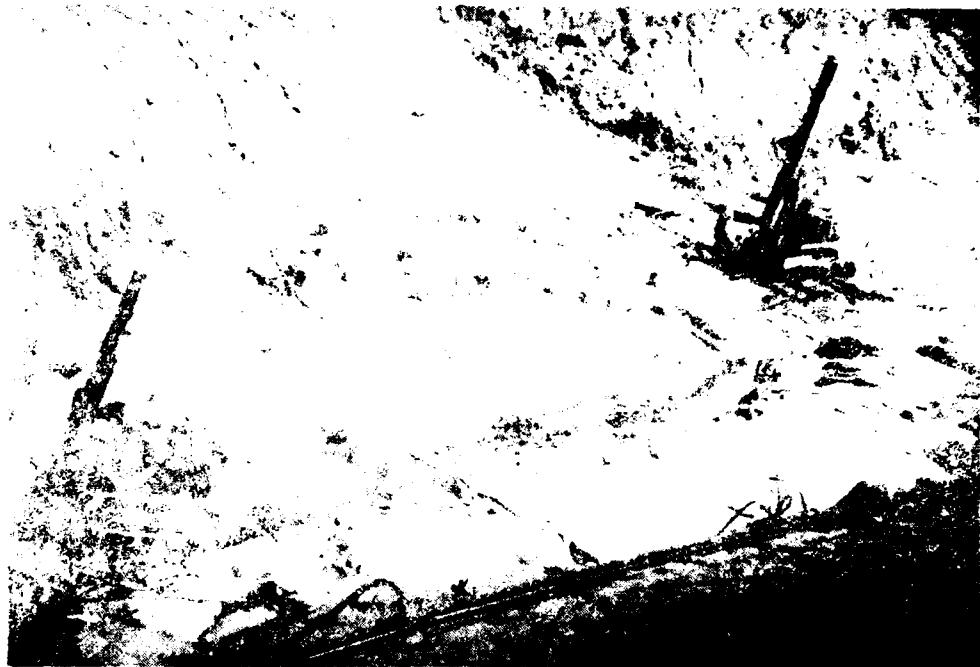


Photo 145 - Line drilling grout holes in Georgia embankment - Note 20° west inclination.



GEORGIA WEST EMBANKMENT - "BATHTUB" AREA PHOTOS



Photo 147 - "Bathtub" prior to perimeter hole layout



Photo 148 - "Bathtub" prior to perimeter hole layout



Photo 149 - "Bathtub" treatment

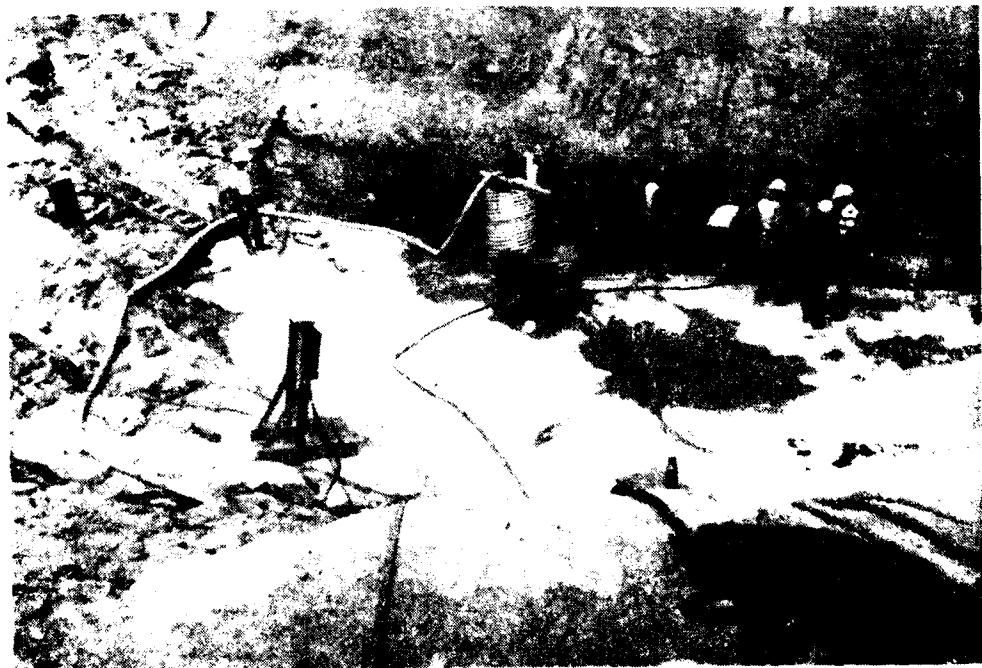


Photo 150 - "Bathtub" treatment

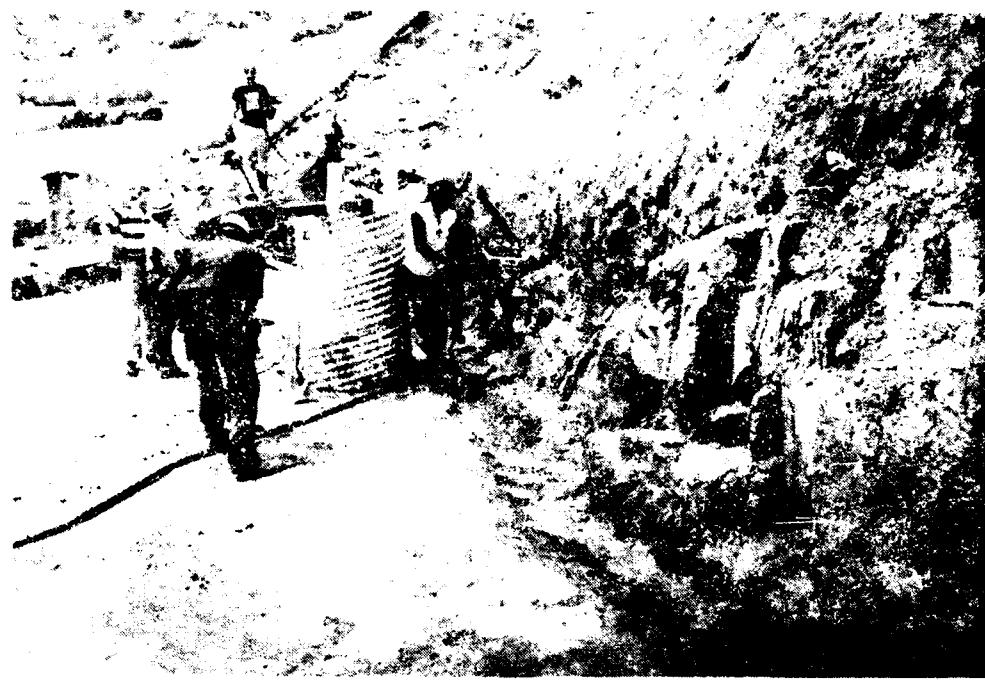


Photo 151 - "Bathtub" treatment - compaction coarse filter around area after concrete placement.



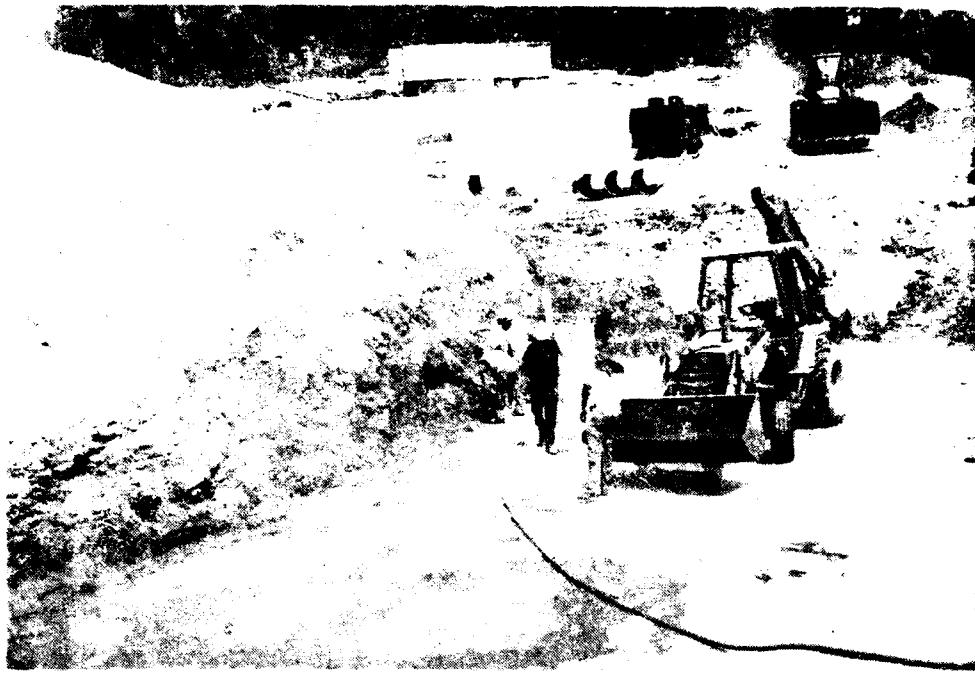


Photo 153 - "Bathtub" treatment - setting coarse sand filter after concrete placement.

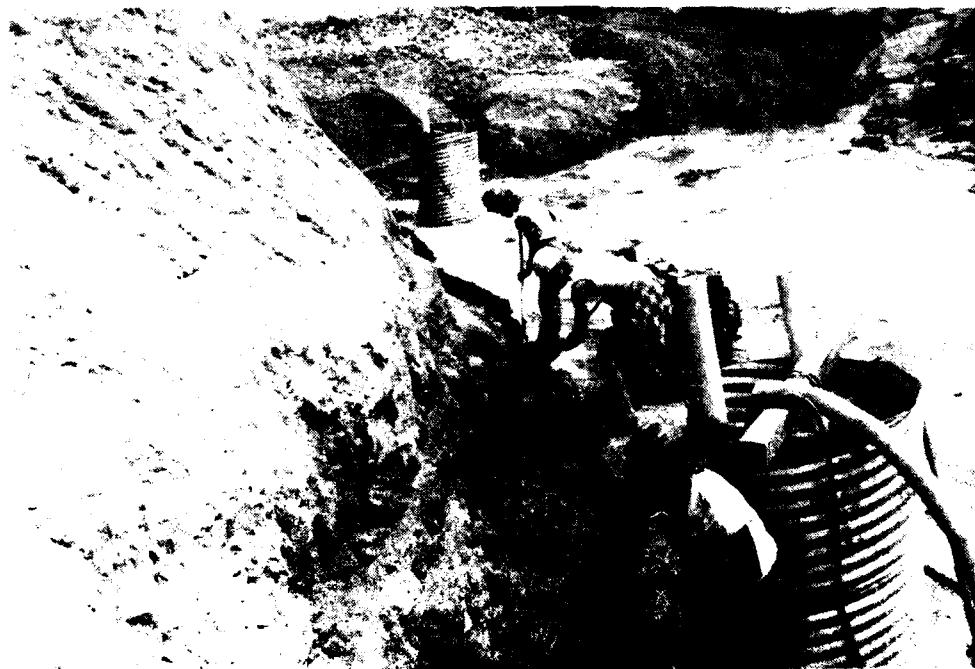


Photo 154 - "Bathtub" treatment - coarse sand filter.

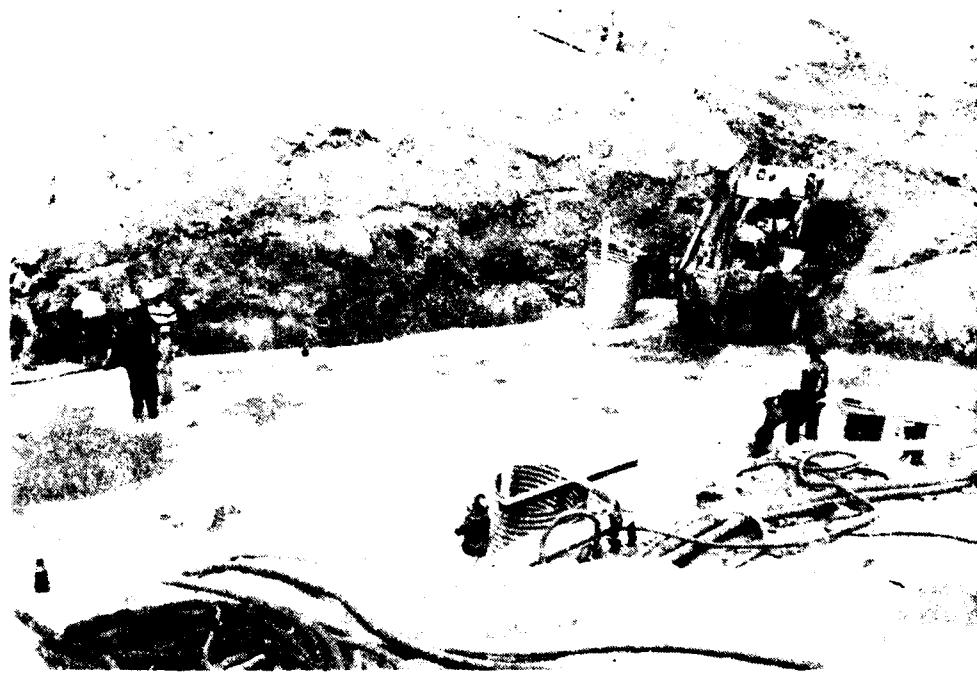
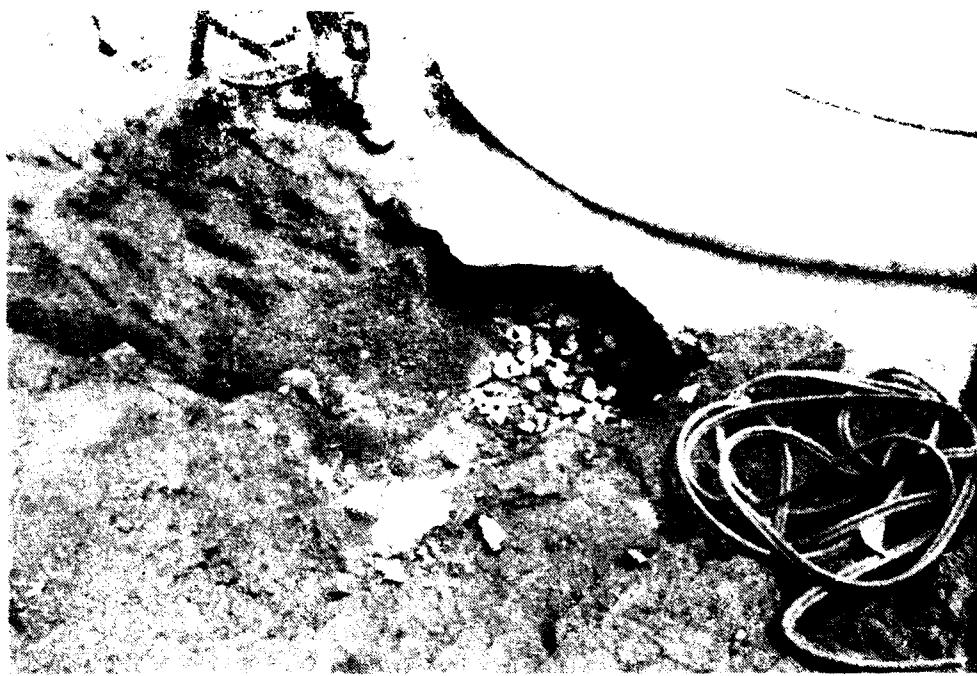




Photo 157 - "Bathtub" treatment - placing concrete by hand.

GEORGIA EAST EMBANKMENT PHOTOS

K-111



Chart 15a - Excavation of broken material in boulders near joint with Monolith 4, material has not been blasted (September 1978)

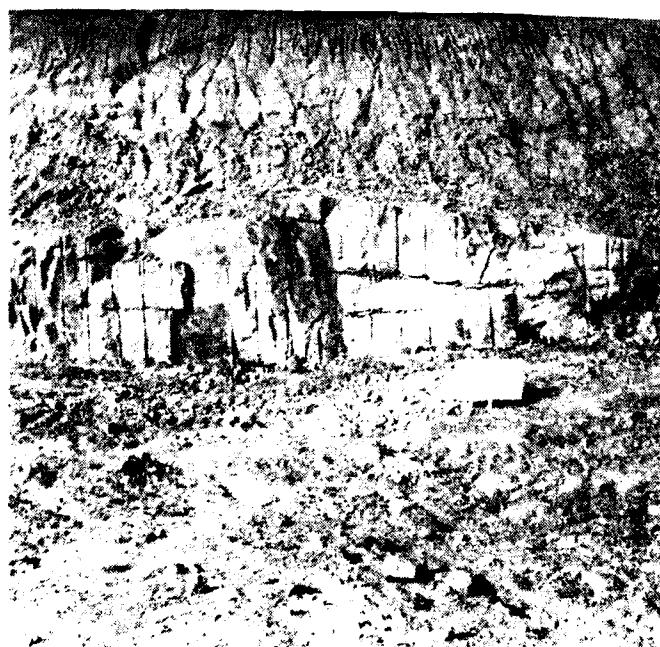




Photo 160 - Georgia east embankment cleanup. Note quarry operation in background.



Photo 161 - Georgia east embankment cleanup. Note quarry operation in background.



Photo 161 - Georgia coast foundation - note Monolith in right
(station 2 + 00 - 23 + 00)



Photo 162 - Georgia coast foundation after removal of debris
Note Monolith footers at right
(station 2 + 00)



Photo 164 - Georgia east abutment downstream of Monolith 4
(October 1978)



Photo 165 - Washing of Georgia abutment for consultation with
OCE, SAD, and SAS. (September 1978)



Photo 166 - Mud seams exposed downstream of Monolith 2. Note lens cap just over joint. (August 1978)



Photo 167 - Georgia abutment Monoliths 3-7 after cleaning by machines. (October 1978)



Photo 168 - Georgia embankment downstream Monolith 6



Photo 169 - Georgia east embankment downstream Monolith 2



Photo 170 - Georgia east looking upstream at Station 22 E 60 (January 1981)

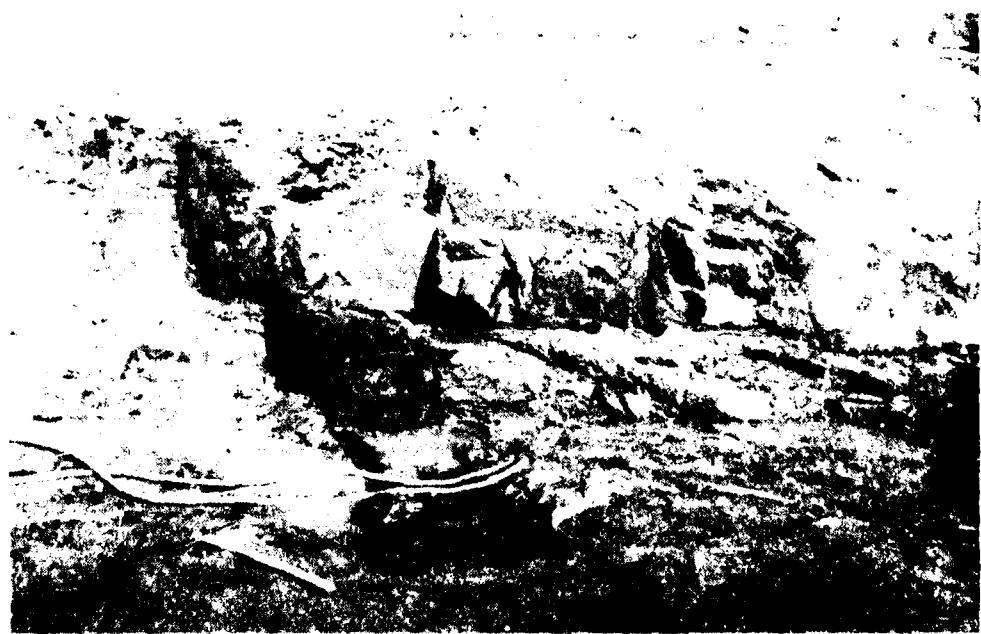


Photo 171 - Georgia east looking downstream at Station 22 E 60 (January 1981)



Photo 172 - Problem below Georgia east bluff in grouting area.



Photo 173 - Problems below Georgia east bluff in grouting area.

SOUTH CAROLINA EMBANKMENT PHOTOS



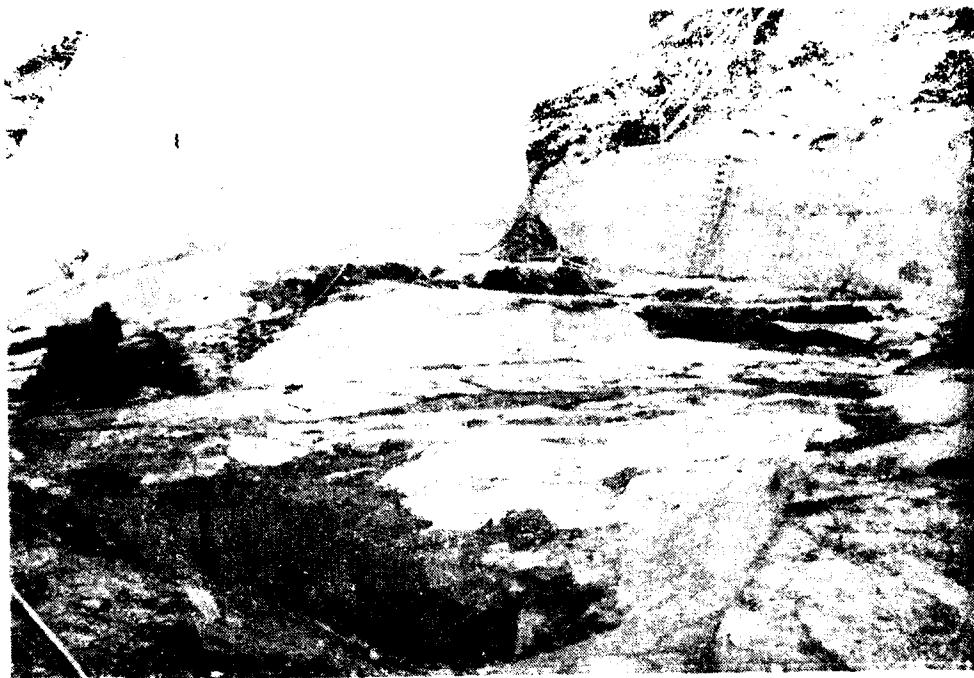


Photo 176 - South Carolina embankment foundation.



Photo 177 - "Monolith 33" and South Carolina embankment foundation.



Photo 178 - "Monolith 33" and South Carolina embankment foundation.



Photo 179 - South Carolina embankment plug downstream of dam.



Photo 180 - South Carolina plug area downstream of concrete dam.





Photo 482 - Excavation in South Carolina abutment





Photo 184 - South Carolina embankment foundation - 111 feet.

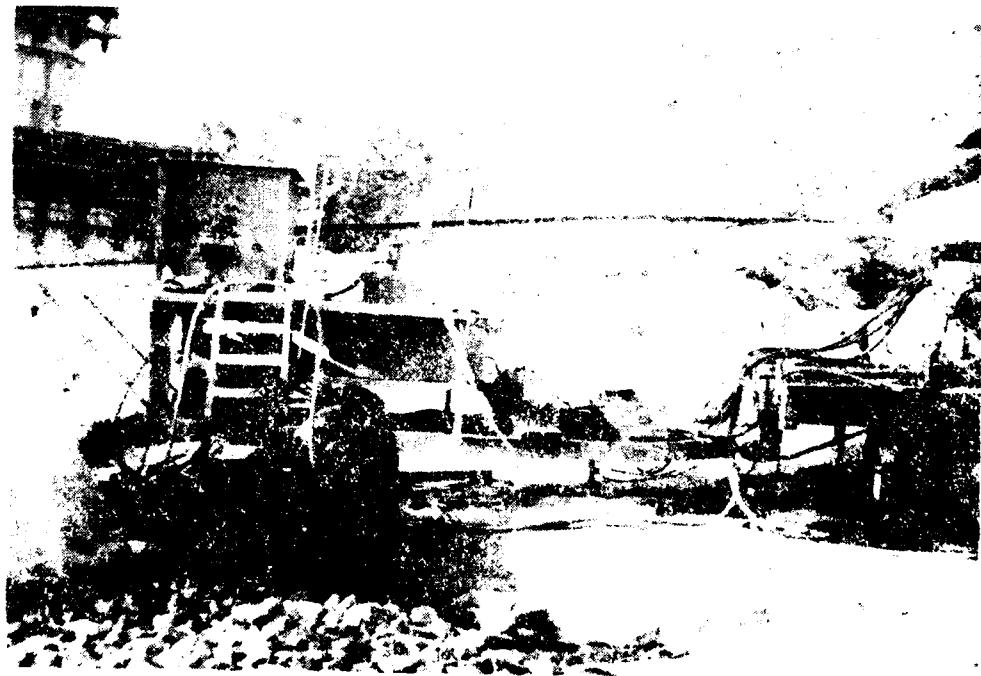


Photo 185 - Riverbank - South Carolina embankment



Photo 186 - Grout plant - South Carolina embankment.

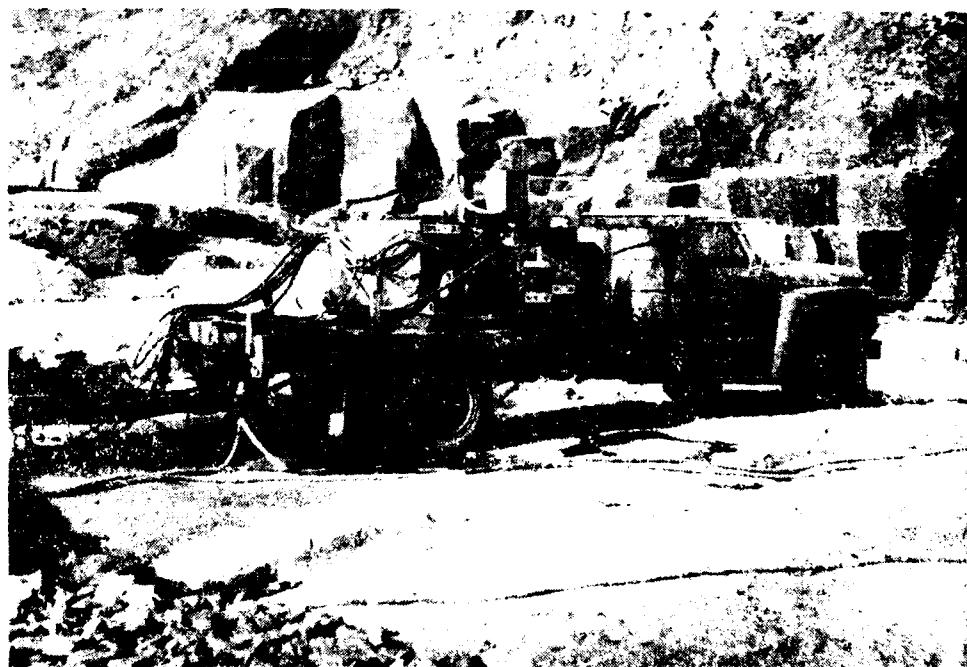


Photo 187 - Grout plant - South Carolina embankment.



Photo 188 - Drilling grout holes on the A-Line, South Carolina embankment.



Photo 189 - Drill water leaks from rock downstream of dam centerline near 30/31 Monolith joints. Communication with grout hole 18+03 was observed in this area (August 1981)